The Electrical Industry's Weekly Magazine

April 10, 1961

Electrical World

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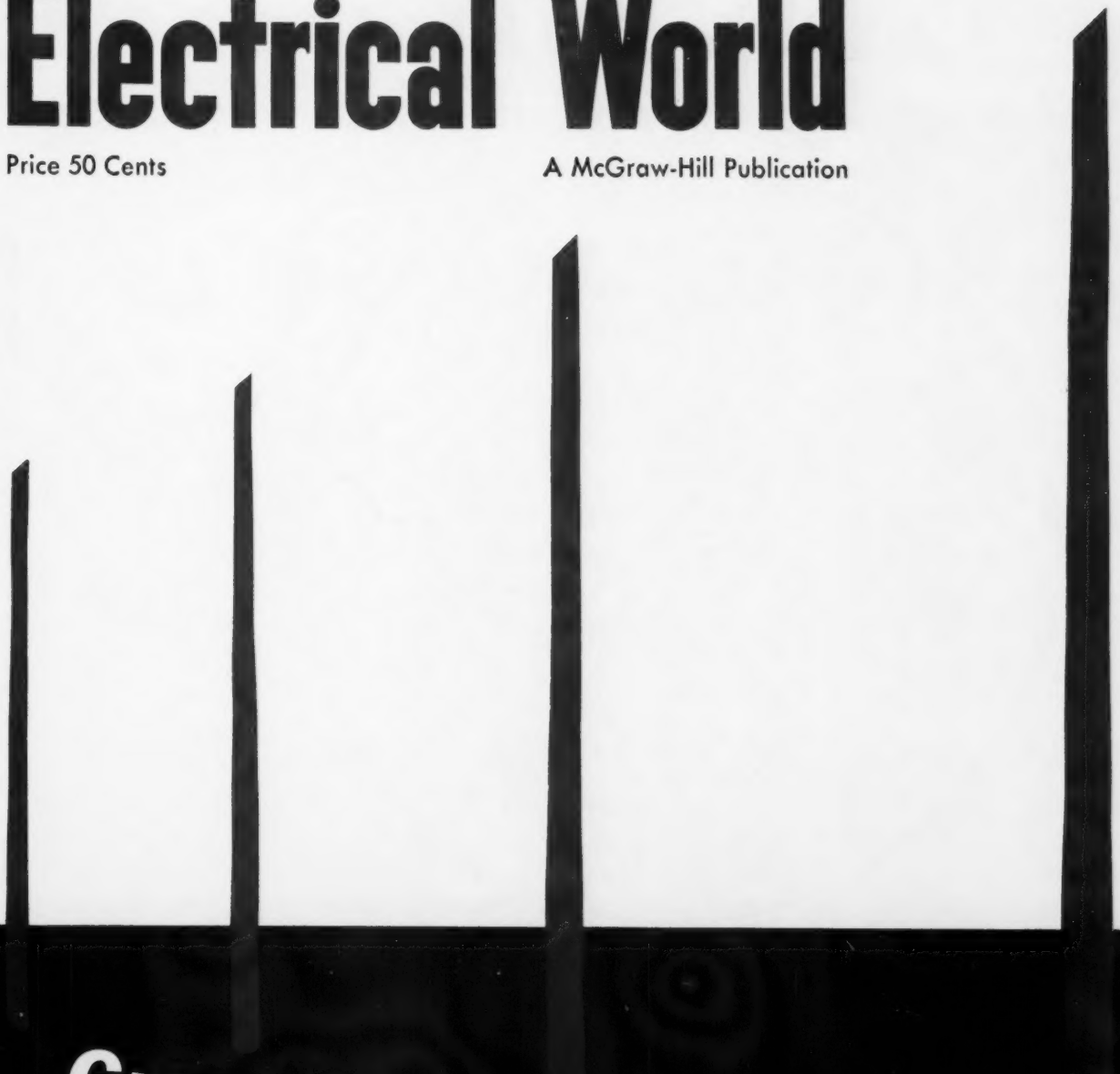

Ground-Line Pole Treatment Needs Fact-Based Timetable...

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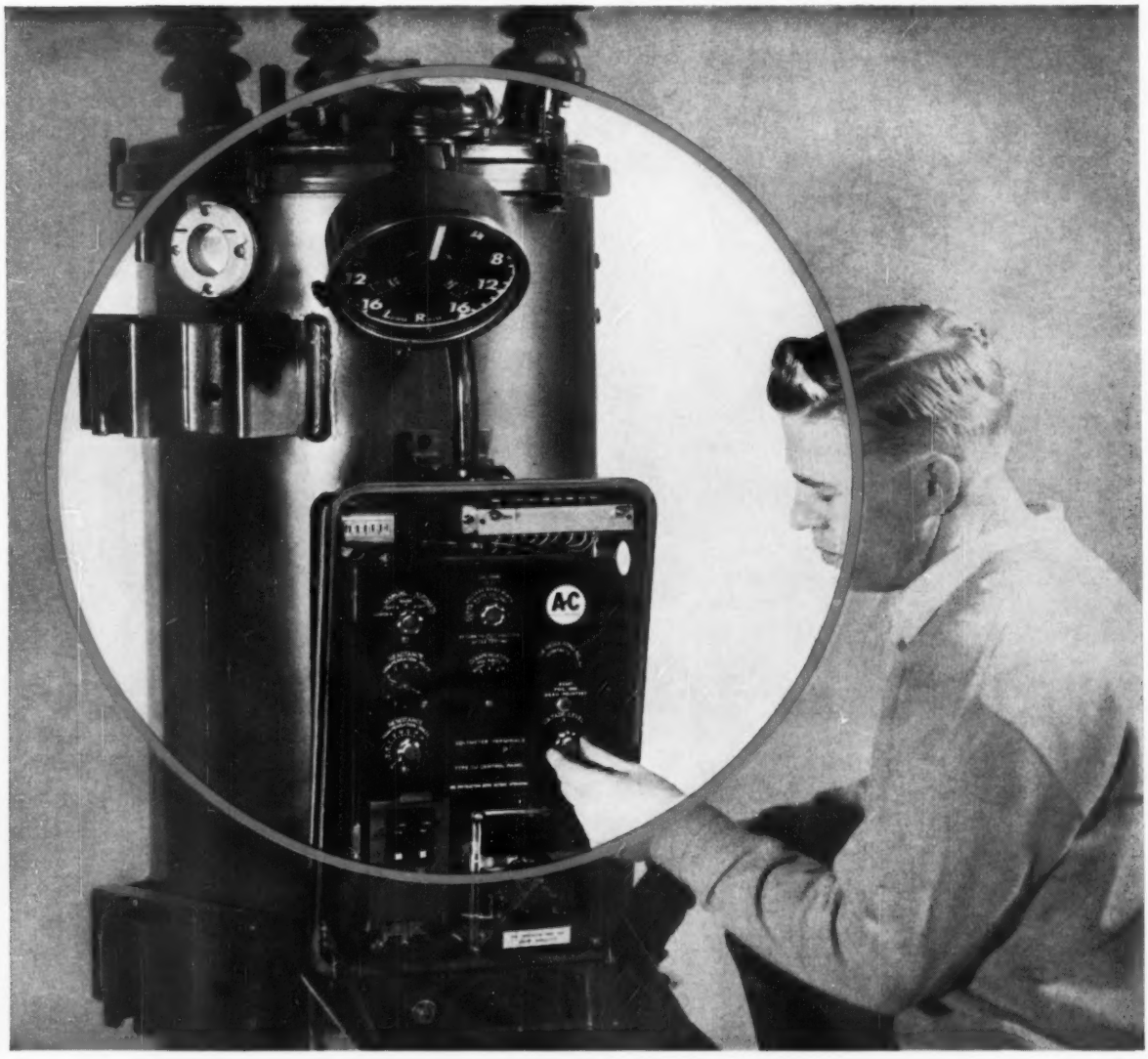

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Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

APRIL 10, 1961
Vol. 155, No. 15

Dateline . . .

Will Preference Stymie California Tie?

Washington, D. C.—Behind the brave talk and the mounting pressure for an EHV interconnection between the Bonneville system and California remains an unresolved political problem.

Stated broadly, the problem is this: Utility systems in the Northwest are most reluctant to open up their hydro-power resources to the whole West Coast and possibly some inland states too.

To open up these resources under present laws would mean very bluntly that the City of Los Angeles would have priority and preference on electric power generated at the Bonneville Dam in Oregon ahead of the investor-owned utilities that operate in Oregon.

Somehow that doesn't seem quite fair even to vigorous federal power advocates in Congress—and especially those Congressmen who hail from the Pacific Northwest.

This situation is now forcing top Interior Department officials to seek some solution to this political problem. Interior Secretary Stewart Udall, in an exclusive interview with *Electrical World*, reported that men in his department are pondering the possibility of an "area preference" arrangement. This would give the Pacific Northwest states a priority on all power generated in the area. Under such a proposal, only energy found surplus to these states would be available for export to California and possibly other states.

But this proposal plainly modifies the power preference clauses written into the various laws authorizing hydroelectric projects in the Northwest. Of these, the clause in the Bonneville Act of 1937 provides the most iron-clad guarantee of federal power to public bodies and cooperatives. It is this clause that has generally controlled the marketing of power by BPA.

Udall's proposal for an area preference would modify the traditional preference by imposing an area priority clause on top of it.

But the area preference seems certain to run into trouble. "The area preference idea is totally unrealistic" comments one specialist in preference clause

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AFTER 30 YEARS ON THE JOB . . . Okolite insulation still looks good. This unretouched photograph shows a section of 11.5 KV power cable recently re-assigned by Duquesne Light Company. Notice that the insulation is still flexible and resilient—workable. Tests show the tensile strength has deteriorated very little, remaining more than 33% above the original specification figure.

How long does an Okonite cable last?

30-year-old Okonite cable still tests above specified values

Here's Okonite Cable'bility* at work. It's "Old Faithful"—a 1250 MCM, Okolite-insulated power cable, made by Okonite's *strip process* back in 1929, now serving reliably as a mine power feeder for Duquesne Light Company of Pittsburgh.

This time-proven cable started in service in the Roaring Twenties as an 11.5 Kv lead from switchyard to transformer, handling 15,000 KVA loads. By 1942 power demands had increased and the cable began fifteen years of full load operation, 24 hours a day.

Then in 1957, "Old Faithful" was replaced by a larger cable to handle a new 25,000 KVA load. At that time, the veteran Okolite insulation was pronounced perfectly suitable for the demanding tasks as a power feeder and was installed in its present location.

There are Okonite "Old Faithfuls" in use today in every application, providing circuit security for their users. That's because, as in 1929, Okonite still produces the most dependable cables available. The reason is Cable'bility*, which is synonymous with The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

*OKONITE Cable'bility...cable craftsmanship since 1878.

***where there's electrical power...there's* OKONITE CABLE**

8273

Dateline . . .

Washington, D. C. (*Continued from page* 3)
politics. "Try to trim the preference clause in the Northwest and you will have the whole public power movement down on you. Or just take a look at the California Congressional delegation and tell me how long they would stand for any modification of preference clauses when they are just about to come into a situation where their areas stand to gain?"

This spokesman, a long-time observer on Capitol Hill, sees the proposed Bonneville-California interconnection as opening up vast power resources to preference customers in California and other states. He sees Oregon as the loser in such a development.

Another approach comes from a utility executive in the Northwest. He recently chatted with Secretary Udall about the possibility of state allocations of federally generated power in the Northwest.

This approach has been discussed before, but in a different context. In the previous discussion, the matter at issue was between the public bodies in Washington and the investor-owned utilities in Oregon. The approach made little headway then.

Once Interior finds an approach that it believes may be politically feasible, there will still be the mechanics of putting it into effect. Probably the most unobtrusive way would be through contracts between Interior and customers in California.

But it would seem likely that investor companies in the Northwest might be wary of such a method. If such contracts were in conflict with preference clauses in existing laws, then there would be a question of whether the contracts had any validity.

At the present time, it would appear that the only sure way of maintaining an area preference would be by law. Such a law would modify existing preference clauses. It does not seem likely that the Interior Department will want to start tampering with the preference clause to which President Kennedy has paid homage in several public statements.

Letters

. . . Whose Ox Is Being Gored

To the Editor:

I could not refrain from commenting on the irony of the two Supply Lines articles on pages 15 and 16 of *Electrical World*, Feb. 27. The first describes the plans of an electrical manufacturer in regard to damages from the antitrust suits.

Immediately following that is "Proposed Copper Cartel Would Meet US Producer Opposition." According to your report this cartel was proposed by Sen Mike Mansfield (D-Mont.), whom we assume has many constituents working in the copper industry, and recommended by President Kennedy, Adlai Stevenson, and George Ball. It is stated that it would raise prices, would regulate "who could trade with whom," and eliminate competition.

Isn't there some similarity in these words to the charges in the antitrust cases?

L. B. LeVesconte
Chicago, Ill.

Don't Confuse Structural With Stainless

To the Editor:

Your March 6 issue carried a report on several papers on the subject of EHV operating data given at the AIEE Winter General Meeting. I would like to correct one statement made on page 33 to prevent misunderstanding by the casual reader.

Discussing the paper on metallic towers in Project EHV, you said, "The steel towers, of conventional contours, have square, rectangular and narrow bases and use both A-7 structural steel and high-strength, low-alloy stainless steel." All of the towers referred to, except No. 18, were fabricated using a combination of A-7 and Man-Ten (A-440) steels and were galvanized. Tower 18 is composed of Cor-Ten steel and erected uncoated.

. . . Both are members of the high-strength, low-alloy family of structural steels and should not be confused with stainless grades.

Joe C. Pohlman
Industry Representative-Utilities
United States Steel Corp
Pittsburgh 30, Pa.

ELECTRICAL WORLD
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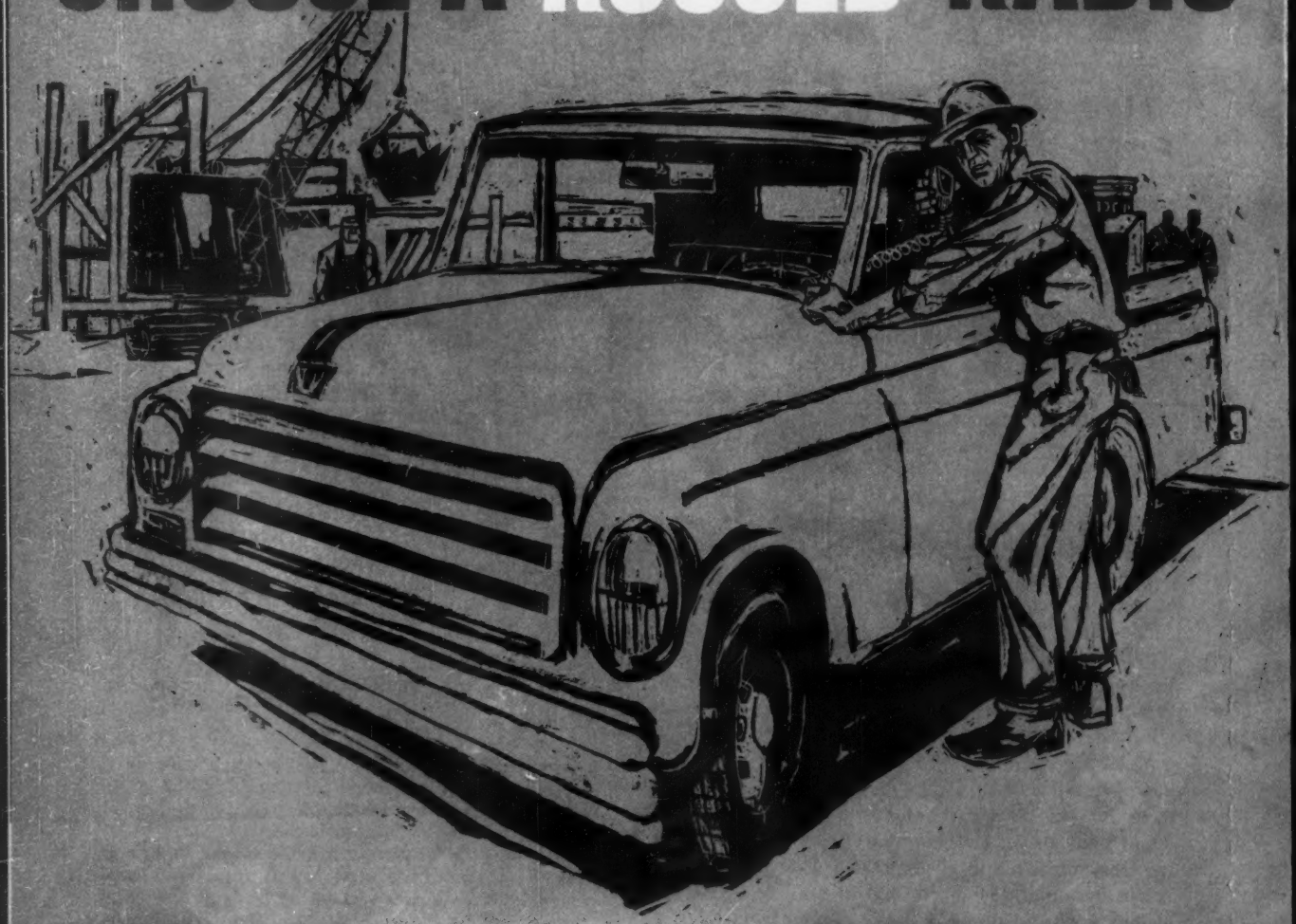

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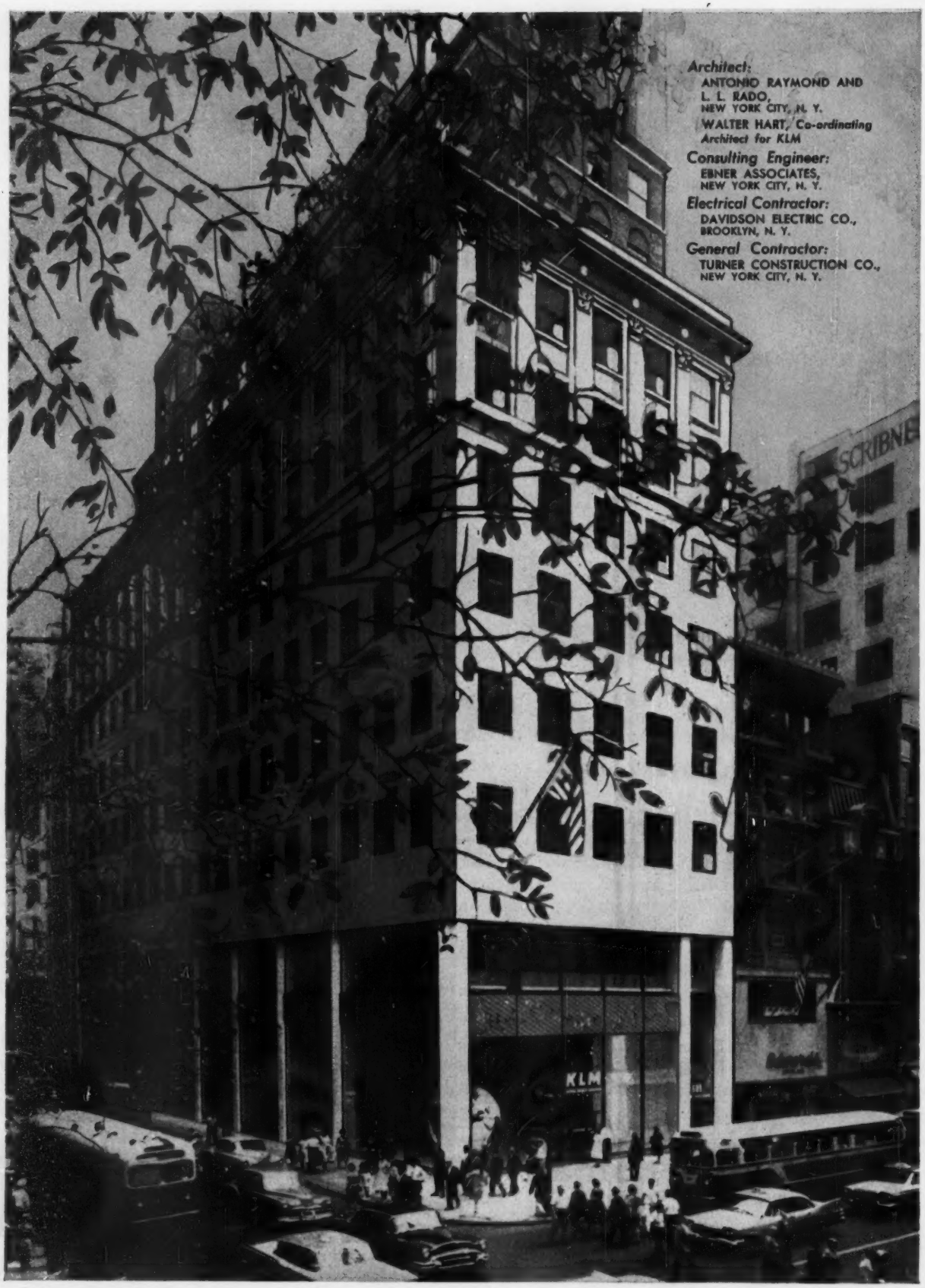

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NEW YORK CITY, N. Y.
WALTER HART, Co-ordinating
Architect for KLM

Consulting Engineer:
EBNER ASSOCIATES,
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BROOKLYN, N. Y.

General Contractor:
TURNER CONSTRUCTION CO.,
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Electrical Protection *is MODERNIZED* with BUSS fuses in the KLM Royal Dutch Airlines Building, New York City

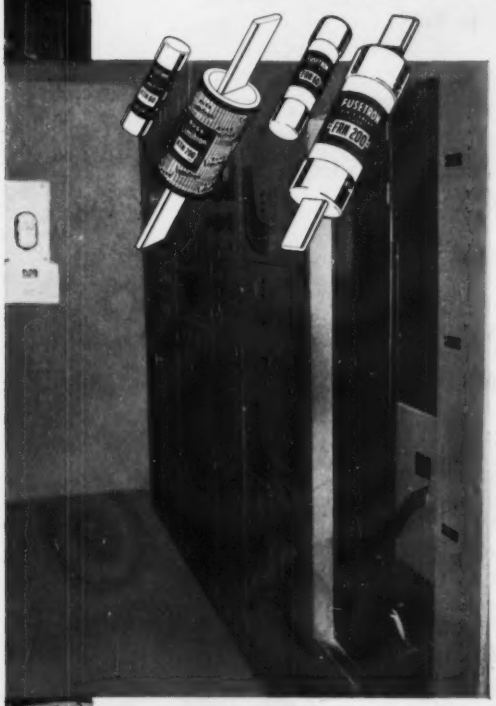
KLM INSTALLATION POINTS OUT THE NEED FOR SAFE INTERRUPTION OF HIGH FAULT CURRENTS

A 3 million dollar modernization program was recently completed on this 13 story office building at 609 Fifth Ave., which houses the American Executive and first floor ticket offices of KLM Royal Dutch Airlines.

To meet power requirements, the capacity of the electrical system was greatly increased, resulting in an estimated available fault current level approaching 100,000 amperes.

In the main switchboard, Buss LIMITRON fuses are installed to provide the high interrupting capacity necessitated by the available fault current and to give great current limitation needed to protect circuits and equipment.

To further assure safe protection and to safeguard against needless outages, distribution and feeder circuits are equipped with FUSETRON dual-element fuses.



Part of Main Switchboard Protected by:
3-3000 amp., 3-1200 amp., 6-1000 amp.,
BUSS LIMITRON FUSES and
15-400 amp., 3-350 amp., 3-275 amp.,
3-250 amp., 9-200 amp., 3-125 amp.,
3-90 amp.,
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Fuses Offer the Safest, Most Practical Solution to Modern Protection Requirements

As electrical network capacities increase, available fault currents of 75,000 to 100,000 amps and up are no longer uncommon.

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Fuses provide high interrupting capacity at a very low cost. Buss LIMITRON fuses have an interrupting rating of 200,000 amps. rms symmetrical — and for FUSETRON dual-element fuses it is 100,000 amps.

CURRENT LIMITATION

Buss LIMITRON fuses also provide current limitation so that fault currents are shut-off before equipment on the circuit can be damaged.

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Fuses remain safe and accurate through the years. Fuses have no triggers, latches, pivots or contacts to stick or get out of order. They require no expensive maintenance or recalibration — they are always ready to function the instant trouble occurs.

To help you select the proper fuse, write for the new BUSS booklet . . .
BASIC PROTECTION FOR ELECTRICAL POWER SYSTEMS.

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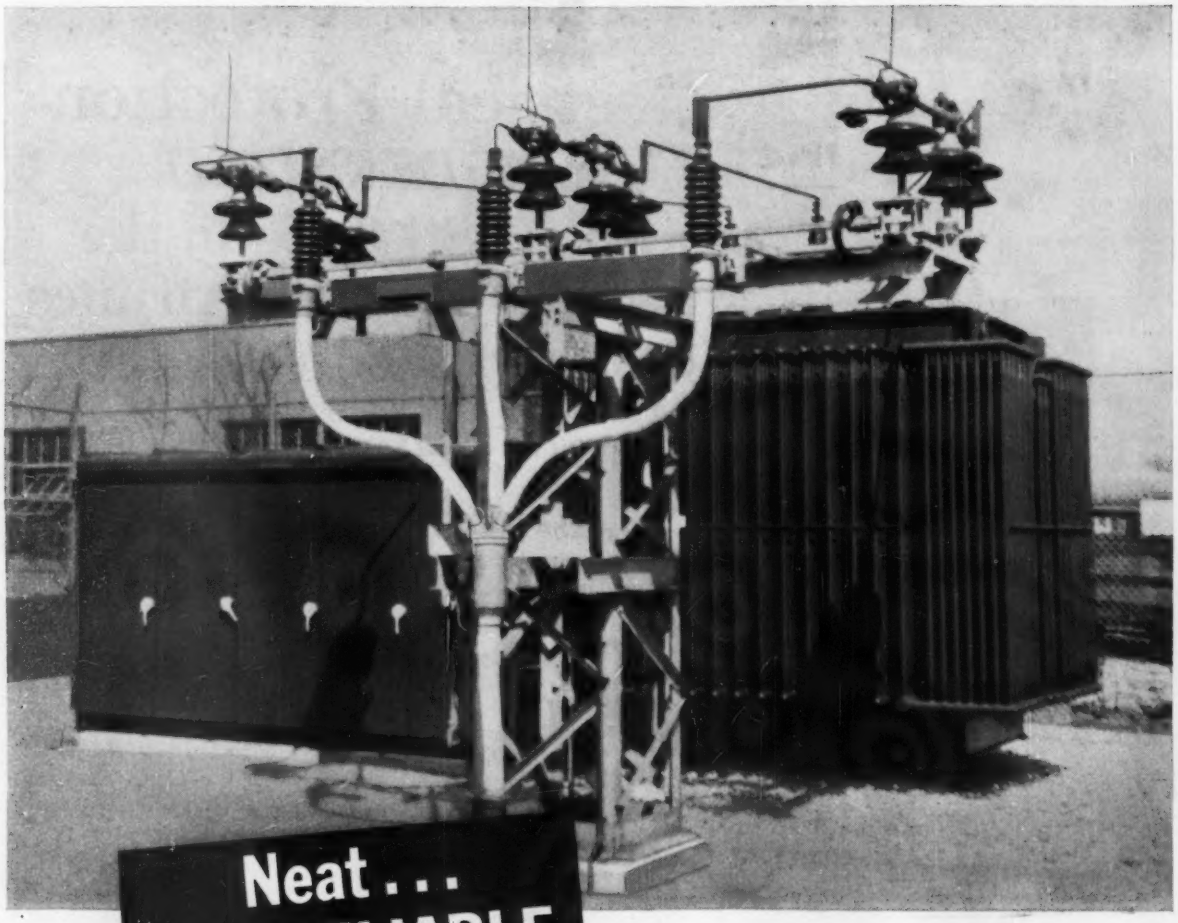
University at Jefferson, St. Louis 7, Mo.



Neat . . . and RELIABLE

This industrial transformer load-center was installed in minimum time, requires little space, and presents an exceptionally neat appearance, largely because circuits were brought in underground and there are no overhead wires and few structures.

Standard G&W "ST-Sodertite" Potheads were used to terminate the 34.5-kv primary supply to this transformer station for long-time reliability. Type "ST" Potheads are permanently sealed at the factory by metal-to-porcelain soldered joints thus reducing the number of field operations necessary to seal the pothead against weather. Semi-conducting glaze on the porcelain between bottom petticoat and wiping sleeve controls longitudinal dielectric stresses of the cable termination. Extra internal creepage distance provided by closed hood and simple ferrule design further enhance reliability. Spun copper wiping sleeve and hood eliminate possibility of porosity, assuring maximum protection.

Get all the facts about standard G&W "ST-Sodertite" Potheads from your G&W representative or by writing for Bulletin AA56.

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Electrical World

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Vol. 155, No. 15

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The Electrical Week

LATE NEWS ▶ **Congress hands President Kennedy a short-cut method** for reforming the federal regulatory agencies as House and Senate vote a two year extension of the Reorganization Act of 1949. Act makes President's formal proposals for agency reforms law unless vetoed by House or Senate within 60 days. Kennedy can now implement many of Landis' less controversial suggestions.

British Columbia legislature instructs government to consider take-over of B. C. Electric, West Kootenay P&L, and East Kootenay Power. Largest investor-owned utility in the province, B. C. Electric serves some 600,000 customers, including those of subs. Provincial Premier had threatened take-over earlier. . . . **Vancouver, B. C., Board of Trade urges Canada not to ratify Columbia treaty** until negotiations are completed with US to assure sale of surplus Columbia power "at a guaranteed and satisfactory price."

Montana Power Co will lose 25 Mw of USBR power to preference customers in Missouri River Basin Project when current short-term contract expires next April. New switchyard facilities at Ft Peck Plant will permit USBR to feed surplus of 33.5 Mw, including Montana Power's 25 Mw, from area west of Ft Peck to customers east of Ft Peck.

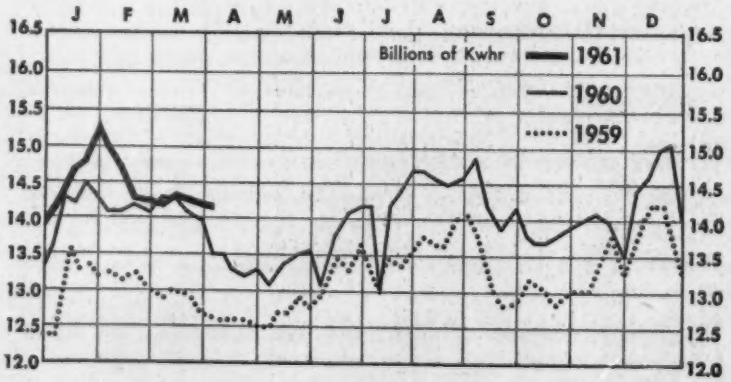
Westinghouse President Mark W. Cresap Jr proposes that NEMA, in behalf of the manufacturers, draft a Code of Ethics for the electrical industry. Speaking on the same subject of the recent antitrust cases, Cresap told 3,000 Westinghouse shareholders attending a meeting in Pittsburgh April 5 that, "unequivocally," top management was unaware of and did not secretly condone the antitrust violations. Referring to the fact that Westinghouse has not disciplined the individuals involved, Cresap said: "Believe me, it would have been the easy route, the expedient path, for me to have discharged these men out of hand and remained aloof from any sense of responsibility toward them. This, in good conscience, I could not do." Stockholders overwhelmingly defeated a motion to replace top management.

US Supreme Court rules 6-3 that government must pay Virginia E&P Co for flooding easement rights in Roanoke River Basin, but says $65,520 is too much. This was payment awarded by lower court, based on maximum value of land. Award now goes back to lower court.

AIEE will hold its first Electrical Engineering Exposition in conjunction with annual Winter General Meeting next February.

WEEKLY POWER OUTPUT—Up 1.9%

(Week ending Apr. 1), Kwhr 14,163,000,000



Percent Change From Previous Year

	Mar. 18	Mar. 25	Apr. 1
Total U. S.	+ 0.5	+ 1.6	+ 1.9
New Eng.	+ 5.9	+ 5.0	+ 1.6
Mid. Atlan.	+ 4.2	+ 4.1	+ 2.1
Cent. Indust.	− 4.0	− 2.7	− 3.0
West Cent.	+ 3.1	+ 4.4	+ 3.8
Southeast	− 5.0	− 2.2	+ 2.6
South Cent.	+ 3.6	+ 4.9	+ 6.6
Rocky Mount	+ 9.6	+11.5	+11.2
Pacific			
NW	+ 3.6	+ 7.4	+ 1.9
SW	+10.0	+ 6.0	+ 5.4

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Source: Edison Electric Institute

Supply Lines

EQUIPMENT SUPPLIERS REPORT LOWER EARNINGS FOR 1960

Equipment suppliers report lower profits for 1960 compared with 1959. General Electric Co says its earnings after taxes dropped 29% to $200,100,000 while sales edged downward 3% to $4,197,500,000. Westinghouse Electric Corp's net earnings declined 8% to $79,057,000 while sales increased 2% to $1,955,731,000. Allis-Chalmers Mfg Co's year-end figures show a 54% drop in profits to $10,583,000 while sales were down 2% to $530,000,000.

McGraw-Edison Co's sales increased 10% to $311,706,000 but its net profit dipped 8% to $13,837,000. I-T-E Circuit Breaker Co showed a $286,000 loss on $115,000,000 in sales. And for the last six months of 1960 Federal Pacific Electric Co had a loss after refundable taxes of $162,194.

Other companies reporting a drop in 1960 earnings are Triangle Conduit Cable Co with an 86% decrease, Thomas & Betts Co with a 6% dip, Worthington Corp with a 7% dip, Cutler-Hammer Inc with a 25% decrease, Joslyn Mfg & Supply Co with a 28% drop, and Sangamo Electric Co with a 77% drop. Also, Ohio Brass Co reports its net income dropped 6%; Combustion Engineering, Inc's net earnings were down 16%; and Anaconda Wire & Cable Co's net income was down 92%.

But two companies report higher earnings. Babcock & Wilcox Co says its net income increased 12% and was at a record high, while Square D Co reports its earnings increased 11% in 1960, compared to 1959.

PRICE MOVES ANNOUNCED IN INSULATORS, INSTRUMENT TRANSFORMERS

Another insulator company has declined to go along with the 3% price increase on bus and switch insulators announced by General Electric Co. Lapp Insulator Co said last week that it would stay with its present prices. Earlier, I-T-E Circuit Breaker Co had said it wouldn't go along with the GE move because it felt the increase would be discriminatory against small power switching equipment manufacturers who have to buy insulators from other companies (EW, April 3, p 13).

In another price change, Westinghouse Electric Corp has announced that on March 14 it changed the multipliers used for pricing instrument transformers as follows: units 15 kv and below changed from 0.80 to 0.79; units above 15 kv changed from 0.80 to 0.81. A day earlier, on March 13, General Electric increased discounts on dry-type instrument transformers by 1% and decreased discounts by 1% on liquid-filled instrument transformers (EW, March 27, p 22).

REA SENDS MEMO TO BORROWERS ON ANTITRUST DAMAGES

The Rural Electrification Administration has sent a memorandum to all electric borrowers that deals with the recovery of overcharges on electrical equipment coming in the wake of the Philadelphia antitrust actions.

REA says the memorandum stems from a number of requests it has received from borrowers "for information which would assist them in determining whether there is a basis for their seeking recovery of possible overcharges." But it notes that while it is "concerned with any developments which affect the financial position

of its borrowers, the determination whether and to what extent damage has been sustained and as to what course of action to be followed must be made" by the borrowers.

Included with the memorandum is a lawyer's brief which reviews the proceedings and "interprets the present situation in terms of the significance to REA borrowers of the [court] decisions which already have been handed down." Essentially, this interpretation says that to determine damages, an "appropriate" method would be to compare prices before and during the conspiracy.

The memo also summarizes the cases, describes the equipment involved, and lists REA borrowers referred to in the civil suits which accompanied the indictments.

IDENTICAL BIDS IN WASHINGTON NEWS AGAIN

Identical bids are receiving renewed attention in Washington. President Kennedy is issuing an executive order that would require all heads of federal agencies to report identical bids to the Justice Department which would then sift through them to discover if there are any signs of collusive activity such as bidding patterns, rotation of bids, and the like.

In addition, bills have been introduced in Congress which would do substantially the same thing as the President's executive order. One is by Rep Wright Patman (D-Texas) and would require the Justice Department to submit to Congress quarterly reports listing all identical bids turned over to Justice by government agencies.

Finally, part of Sen Estes Kefauver's (D-Tenn.) hearings on the electrical industry, which start April 13 will deal with an extensive Defense Department compilation of identical bids that the department has received in recent years.

RECLAMATION INSTITUTES DEPRESSED AREAS BUYING POLICY

A new Bureau of Reclamation policy, to purchase aluminum conductors and steel overhead ground wires from firms in labor distressed areas, was announced last week by Interior Secretary Steward Udall.

The new labor surplus "set-aside" program is being studied on how it will affect the Bureau's bid invitations through June 30 — the end of the present fiscal year. "We expect this new policy will result in the placement of several million dollars in contracts with firms whose fabricating plants are located in depressed areas," said Udall.

The first two procurement contracts to be made under the new set-aside program are: (1) 60% of conductors and ground wire needed for the Bureau's 230 kv transmission line from Glen Canyon Dam to the Four Corners area, with normal competitive bids opened March 30 on the remaining 40% of requirements; (2) 60% of the conductor and ground wire for the Bureau's second 230 kv line from Trinity Dam to the Central Valley System in California.

Udall said he "understands" that "at least three" of the "five or six" domestic aluminum producers, capable of producing the size of conductor needed for the lines, have plants in labor surplus areas.

New lightweight

VAREX®

new Varex is 23% lighter...25% thinner ...and still has the lowest current density

cuts application cost, too!

Capacitors, you've noticed, are getting smaller. With good reason, too!

Smaller dimensions and lighter weight mean easier handling, more convenient installation, lighter racks and lower bending moment on the pole top - - savings all around for buyer and user.

That 25% reduction in thickness illustrated above, for example, brings the length of a 2000-kvar Varex stacking rack down from 168 inches to 132 inches. On the pole top, a 600-kvar Varex in-line equipment shrinks from eight-feet one inch in length to six-feet nine inches. And Varex units still have the lowest over-all height.

Despite these changes, some things *remain unchanged* in the Varex "lightweight 50." Among them is the time-proved principle of extended foil cooling - - the unique design feature that lowers operating temperature and reduces maximum current density to one-fifth that of conventional lightweight units.

Send today for our new four-page catalog-type descriptive brochure, O-B Publication No. 1494-H.

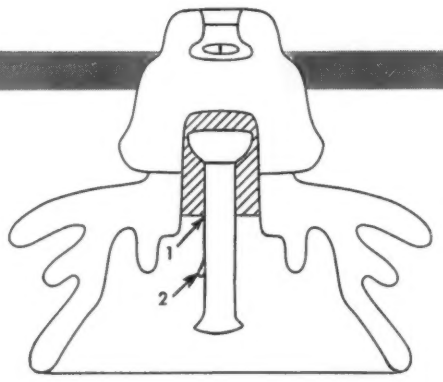
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

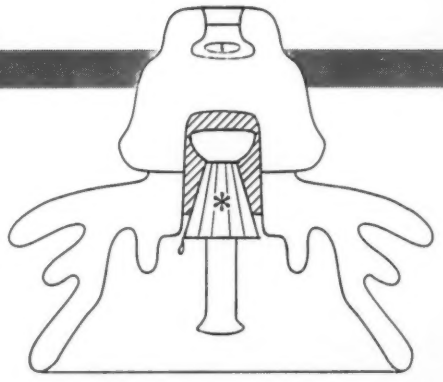
HOLAN

10092-H



Conventional Smogtype suspension insulator

Extra leakage distance offers no protection from corrosive attack on the pin above the cement line (1) or from corrosive attack on the shank (2). Compare this with the sketch at right.



Futura Smogtype suspension insulator

Corrosion Intercepting Sleeve yields slightly as rust products form above cement line, preventing cracking of the porcelain. Sleeve also diverts corrosive salt-water drainage from the pin shank.

specify FUTURA® WITH C.I.S.* to

*CORROSION INTERCEPTING SLEEVE

Conventional Smogtype insulators have only one defense against contamination - - extra leakage distance.

Sometimes, it isn't enough.

To see why, examine the unretouched photograph on the right.

It shows a conventional Smogtype suspension insulator after an extended period of service on a 69-kv line in a heavily contaminated atmosphere - - the "natural habitat," you might say, of all Smogtypes.

Under these conditions, the insulator - - thanks to its 50% greater leakage distance - - protected the line from flashovers - - for a time.

But greater leakage distance, unfortunately, couldn't protect the insulator *itself* from the inevitable by-product of contamination - - *corrosion.*

Moisture, saturated with corrosive salts (dissolved out of surface contaminants), diffused across the underside of the porcelain and across the cement joint to the pin, where the corrosive attack began.

Creeping upward in the cement joint by capillary attraction, the moisture formed rust products (hard as cast iron) between pin and cement - - rust products that expanded in volume until the porcelain cracked.

Drainage down the pin shank fed a simultaneous attack, destroying metal and freezing the clevis connection.

In heavily contaminated "Smogtype" atmospheres, where corrosion hits hardest, you often need *more* than extra leakage distance - - you need *corrosion protection* for the insulator *itself.*

You can get it today, in Smogtypes or non-Smogtypes, by specifying Futura insulators with the exclusive Corrosion Intercepting Sleeve.

Only Futura *protects itself* and your transmission line, too!

10082-H

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

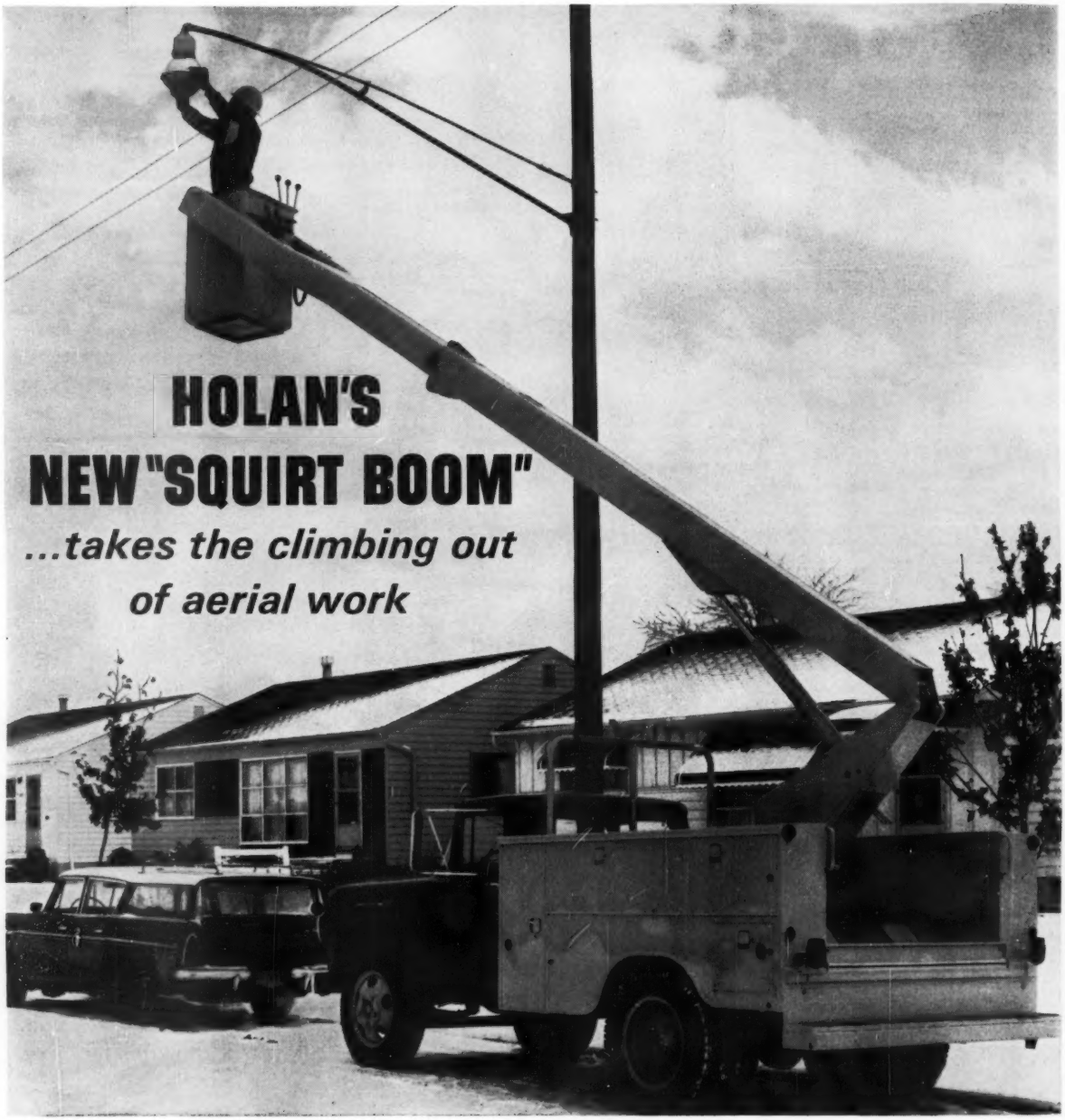
HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

the finest smogtype insulators made today...

lick corrosion

sometimes aren't good enough!
(*without C.I.S.**)



Here it is — Holan's new all-hydraulic Squirt Boom. Ideal for troublemen . . . the fast, safe way to re-fuse transformers. Saves money in group lamp replacement work . . . no climbing up and down a ladder and material and equipment ride in the bucket with the man. Speeds such work as installing electric service, mid-span taps, traffic signal and street light maintenance.

Now one man can do many aerial tasks because he has complete control with levers mounted on the fiberglass bucket (boom and bucket tested at 73,000 volts (A.C.) bucket-to-ground). Telescoping fiberglass boom extends 10′7″. . . raises to a 40-foot working height . . . rotates 360° in either direction. A hydraulic slave cylinder, located in fiberglass bucket yoke, keeps bucket level at all times.

Safe, dependable master-slave type controls are mounted on the bucket and on superstructure. Offset superstructure design and exclusive Holan torsion bars, attached to the body base, provide stability in all positions with a 300-pound payload . . . no outriggers needed.

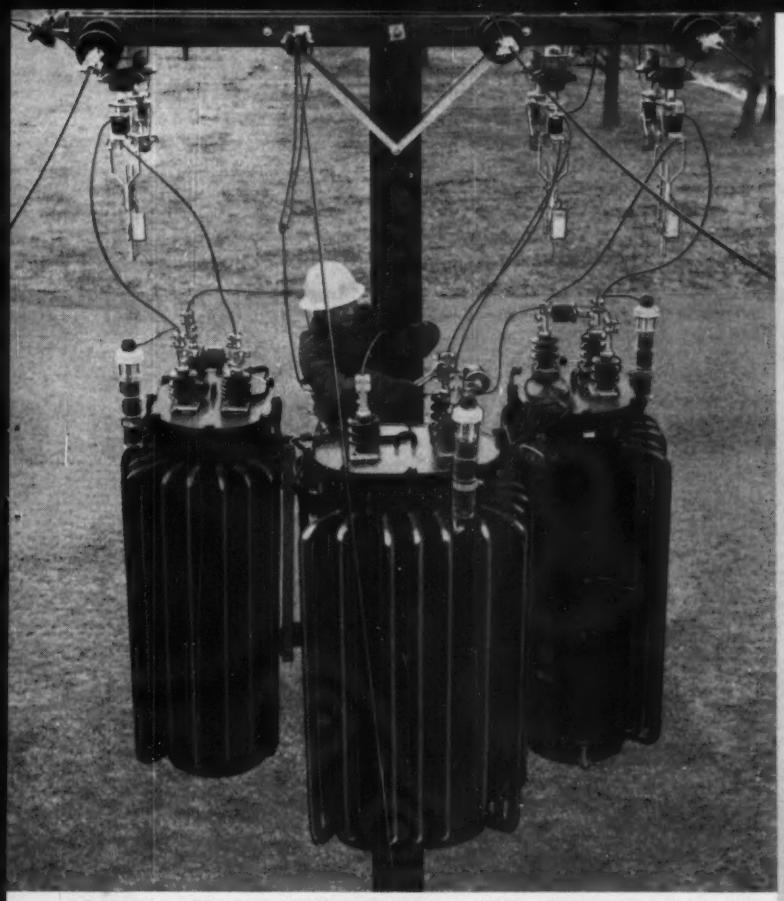
Let us send you more details on the Holan Squirt Boom . . . designed and built for safe, fast, economical aerial work. Call your Holan Field Representative, or write us.

Holan Corporation, 4100 West 150th St., Cleveland 35, Ohio

Holan

Subsidiary of THE OHIO BRASS COMPANY

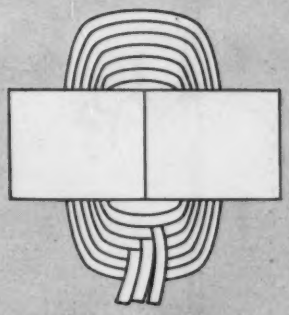
HOLAN



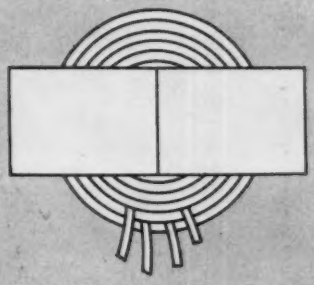
5,000 KVA OF LOAD REGULATED FROM A SINGLE POLE! Here, three L-M 219 ampere, 7620 volt regulators are cluster mounted to provide regulation on a 7620/13200 volt multi-grounded wye distribution feeder.

APRIL IS L-M REGULATOR MONTH

HIGHER SHORT CIRCUIT STRENGTH



OTHERS—competitors wind regulator coils in a rectangular shape. Mechanical forces induced by short circuit current tend to stress these windings into a circular shape. Rectangular windings are less able to withstand these forces.



L-M—incorporates the exclusive Round-Wound design. Coils are circular in shape and are naturally capable of withstanding higher short circuit stresses.

Regulate Up to 5000 Kva of Line Load With L-M's Cluster-Mounted Regulators

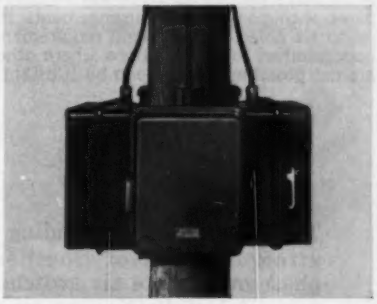
Compact Round-Wound® design cuts weight of L-M 32-step voltage regulators for low-cost cluster-mount installations; also provides exceptionally high short-circuit strength.

Line Material incorporates the exclusive Round-Wound design in all 32-step voltage regulators. As a result all regulators, with the exception of the largest size, can be either pole mounted or cluster mounted.

Now it is possible to provide regulation on lines in established areas where new construction is impossible. Cluster-mounted regulators not only save space, but also completely eliminate the real estate, construction, and labor costs associated with substation installation.

Get Complete Information

Your L-M Field Engineer will be glad to give you assistance and complete information on the application of L-M regulators. Or write Line Material Industries, P.O. Box 510, Zanesville, Ohio.



REMOTE CONTROL—L-M's control cabinet can be separated from the regulator tank. It may be mounted at any convenient location at or near base of pole. Connections between the regulator and the control cabinet are accomplished by a cable and connectors. Control cables and receptacles are available in a range of standard lengths.

OUR 50TH YEAR 1911 – 1961

LINE MATERIAL® Industries

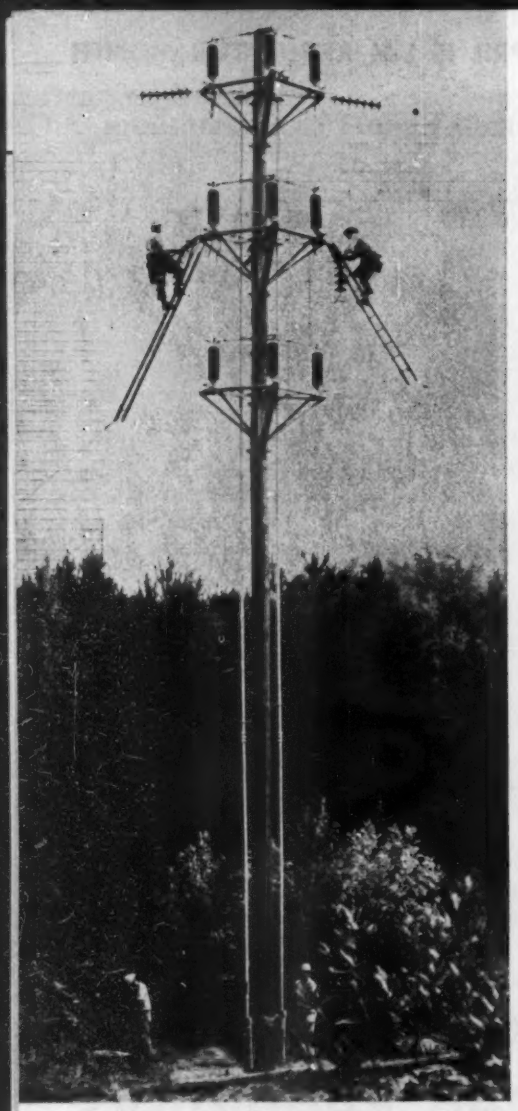
McGRAW-EDISON COMPANY

Regulators

509

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



MINIMUM CREW TIME is needed to install Southern States Pole-Pak Air Switches. One pole is all that's needed for three-way switching, compared with conventional arrangements requiring up to six poles. Limited land requirements offer opportunities for installations where other types are not possible. Savings can be substantial.

EXCLUSIVE MOUNTING SYSTEM SPEEDS ERECTION OF SOUTHERN STATES' POLE-PAK

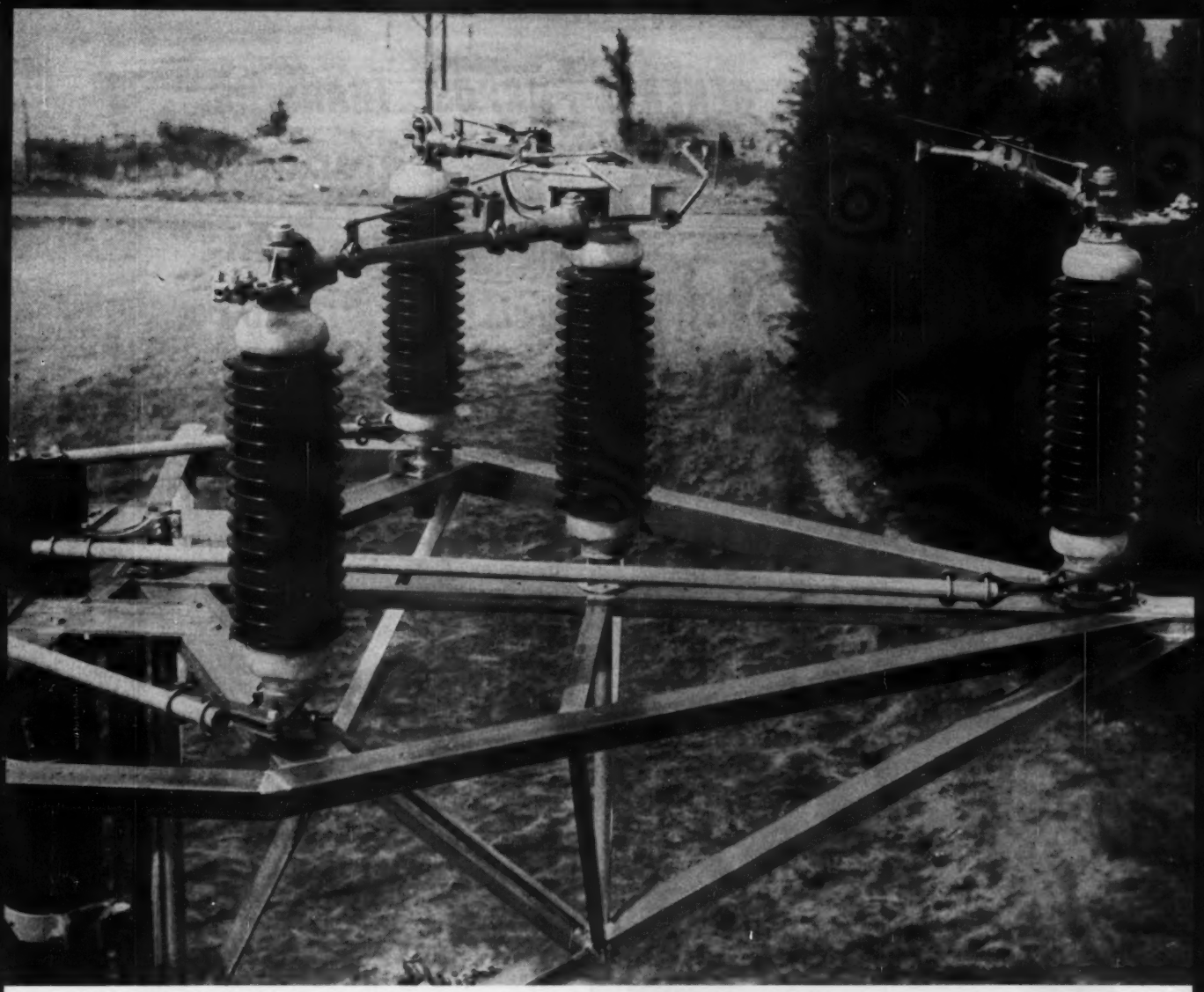
There are many outstanding mechanical and operating features of Southern States Pole-Pak phase-over-phase air switches. But the speed and ease of installation are particularly outstanding advantages.

Southern States employs an exclusive, simplified mounting system. Clamp-type steel bands are fastened to the pole at pre-determined positions. No gaining or drilling is necessary, assuring longer pole life. All switch units are assembled on the ground and hoisted into position. Hooks on the switch frame slip over a mounting plate on the top band, providing temporary suspension and automatically lining up mounting holes for quick and easy permanent bolting. It's that simple!

Other Pole-Pak Features

The Pole-Pak uses Southern States Type 57L braidless air switches. These rugged switches are equipped with Amplitact® contacts, time-proved as the most dependable means devised for handling high short currents.

The Southern States 57L switch is unusually easy to operate. Its blade is designed to toggle into the closed position and has no tendency to open. No force from the operating mechanism is needed to keep the switch closed. The switch is easily oper-



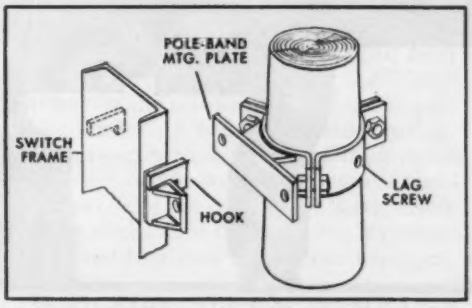
SOUTHERN STATES POLE-PAK is available in voltage ratings from 7.2 kv through 69 kv and continuous current ratings of 600 and 1200 amperes. One- two- or three-way models are available. Southern States Type 57L side-break braidless air switches with Amplitact® contacts are used in the Pole-Pak.

ated by one man, even under icing conditions.

The Pole-Pak frame is constructed of 6061-T6 structural aluminum with adequate bracing for vertical angular pulls in addition to line tensions.

This phase-over-phase method of switching, employing only one pole, with its many time-saving and cost-saving advantages, warrants careful consideration.

Get full information from your Southern States representative, or write for Bulletin 61 PP.



SIMPLIFIED MOUNTING results from exclusive system. Steel band is clamped to pole. Two lag screws prevent slipping. Hooks on switch frame slip over pole-band mounting plate. No drilling or gaining of pole is necessary.

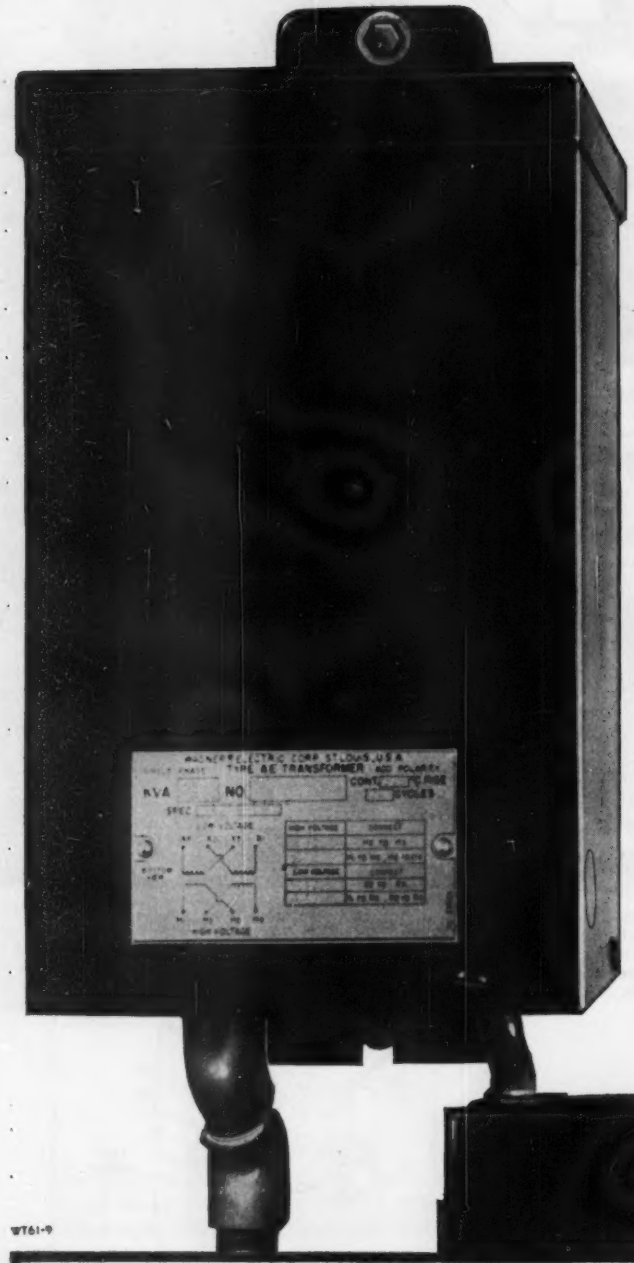
SOUTHERN STATES
HAMPTON, GEORGIA

IN CANADA: DOMINION CUTOUT CO., LTD., TORONTO

WAGNER® DRY-TYPE GENERAL PURPOSE TRANSFORMERS

Compact Epoxy-Filled Units that

WHISPER WHILE THEY WORK



Unusually small in size (the 10 kva rating is less than a foot-and-a-half high), Wagner® totally-enclosed Type AE Single Phase Transformers can be used for general purpose applications. They have a low sound level, the result of encasing small Wagner Form W core and coils in a solid block of epoxy compound . . . to give you a whisper-quiet transformer that can be used anywhere noise would be a nuisance.

Available in ratings from 1 to 10 kva, Wagner Type AE Transformers have insulation protection suitable for continuous operation at 80°C in a 30°C average ambient. All parts are sealed from dust, moisture, and corrosion by the epoxy compound. Every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE Transformers can be installed indoors or out in any location where they will not be submerged or exposed to injurious fumes in concentration. Compact and lightweight, they require no fireproof vaults and can be mounted indoors in any position, at any angle, on wall, floor, or ceiling. These transformers are carried in stock at Wagner branches and distributors. There's one near you, listed in your 'phone book. Call or write now.

Wagner Electric Corporation
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.

WT61-9

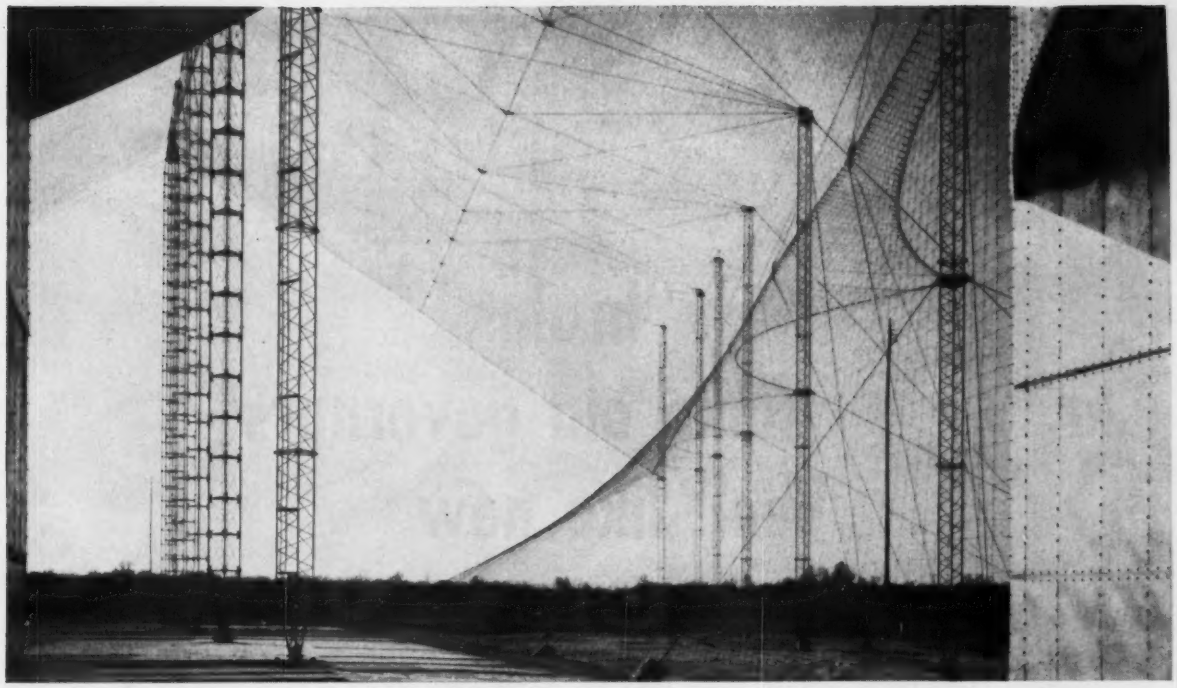
SPECIFICATIONS

Type AE—Single Phase—1 to 10 Kva 80° C Rise, 60 Cycles.

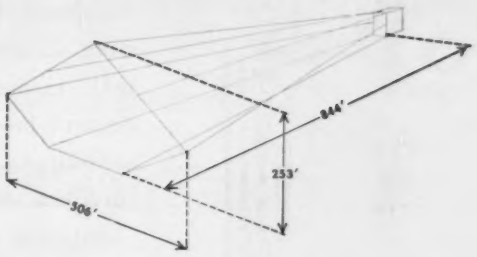
High Voltages: 120 x 240; 240 x 480; 600 volts, no taps; 480, 600 volts, 2—5% taps below normal.

Low Voltage: 120/240 volts.

KVA	DIMENSIONS IN INCHES			NET WEIGHT POUNDS	AVERAGE SOUND LEVEL DECIBELS
	Height	Width	Depth		
1	10 13/16	6 1/16	6 1/16	28	37
1½	11 13/16	6 1/16	6 1/16	34	38
2	13 1/16	6 13/16	7 1/16	46	38
3	14 1/16	6 13/16	7 1/16	62	39
5	15 9/16	9 3/16	9 1/16	93	39
7½	16 1/16	9 11/16	10 3/16	130	39
10	17 1/16	11 1/16	10 1/16	167	39



THE HORN of the ARMY'S BIG EAR



Made with Copperweld Wire

You're looking through the "inner ear" of one of the world's biggest hearing aids. It's the U.S. Army Signal Corps' TAHA—short for Tapered Aperture Horn Antenna. Located in Maryland, TAHA is a highly directional antenna aimed at Hawaii. It is an excitingly new development that reduces interference in long-range, high-frequency communications.

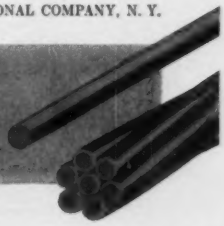
From the "feed house" or apex of the antenna system, a giant, cone-shaped wire-fabric horn reaches out 844 feet to scoop in long-distance radio signals. The horn, with a maximum height of 253 feet, is held aloft by 18 steel towers.

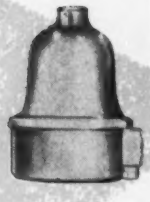
Here, as in many other important engineering projects, Copperweld Steel Company products were specified. And you can see why. Permanent strength and conductivity were vital requirements. The millions of feet of wire fabric in the horn were made with Copperweld Wire. In addition, more than 80,000 double-strand Copperweld preformed tie wires were used to assure proper and permanent spacing of each latitudinal and longitudinal wire in the fabric.

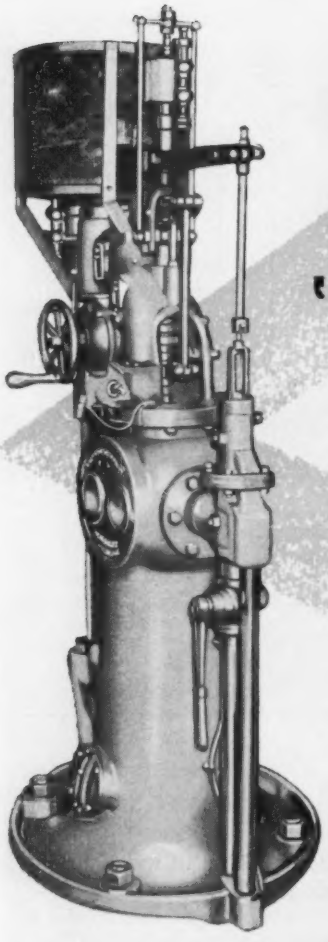
For antennas and towers of all types, Copperweld Wire and Guy Strand provide lasting, rust-proof strength. Each wire has a thick outer layer of copper molten-welded to a core of high-strength steel. The copper cannot flake, crack or peel. The strength of the steel core is permanent—rust and corrosion simply can't happen.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, N. Y.

Copperweld® WIRE and STRAND

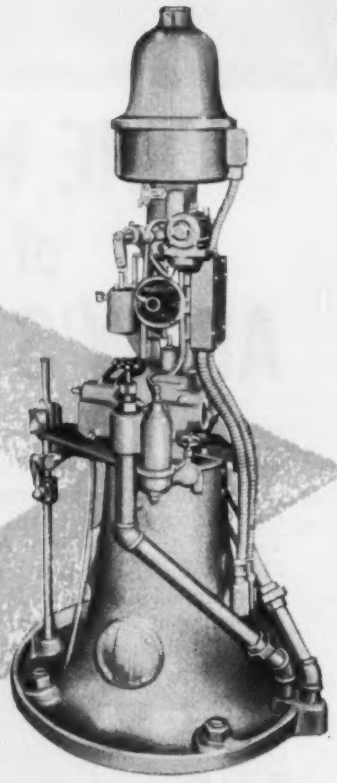


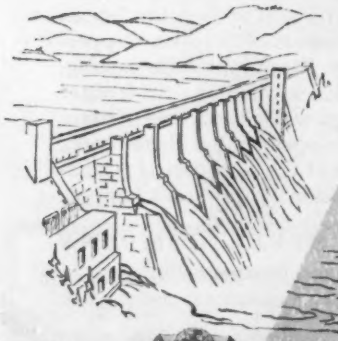




New "brains" make old governors "feel" like new

Old hydro-electric governors sense minute speed changes as quickly as new ones when they are modernized by Woodward. This improved quality means more accurate control of the turbines that are meeting the increased power demands brought on by our rising standard of living. Woodward factory-rebuilt governors are returned to top operating condition at approximately half the cost of new equipment. All the latest speed sensing improvements and modifications are utilized. A new machine warranty assures many additional years of efficient service. Before scrapping worn or obsolete governors, be sure to investigate Woodward's modernization program. Write for details today.





"World's oldest and largest manufacturer of hydraulic governors exclusively"

WOODWARD SERVICE

WOODWARD GOVERNOR COMPANY

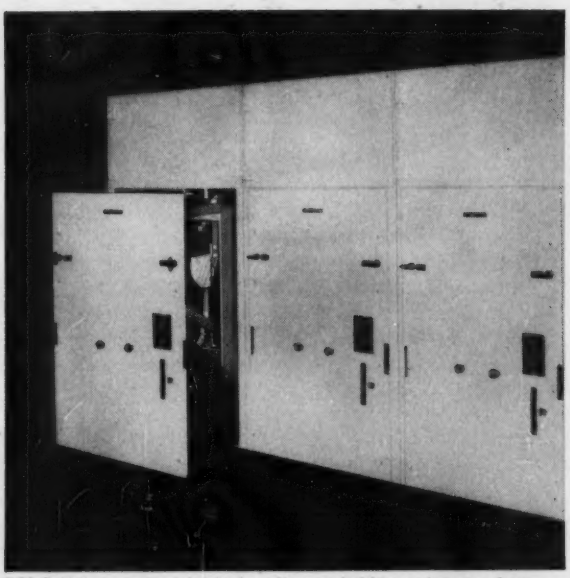
ROCKFORD, ILLINOIS

Fort Collins, Colorado • Schiphol, The Netherlands • Slough, England • Tokyo, Japan

H-101

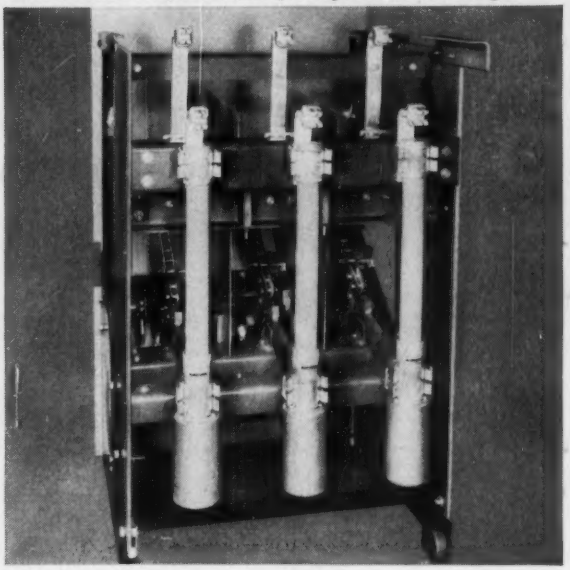
6201
NEW ALUMINUM ASSOCIATION NO.
AAAC alloy formula given to the industry by Kaiser Aluminum!
Recently Kaiser Aluminum released to the industry its original AAAC alloy formula, registering it with the Aluminum Association under the number "6201."
AAAC—all aluminum alloy conductor—was first pioneered by Kaiser Aluminum in 1955. It is made entirely of a high-strength magnesium-silicon alloy of aluminum (now designated 6201). It has the same dimensions and breaking strength as ACSR of equal resistivity; but adds vastly superior corrosion resistance, single sleeve splicing and lowered AC-DC resistance ratios.
K/W
In copper and aluminum cable . . .
THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE
KAISER ALUMINUM
SEE "HONG KONG" AND "MAVERICK" WEEKLY, ABC-TV NETWORK.

New...Low-Cost, Drawout DFS Metal-Enclosed Load-Interrupter Switchgear



DFS Switchgear comes in single units or switching centers, as shown, for service entrances, transformer primary or feeder switching.

DFS drawout switch and fuse element is easily levered into cell.



DFS switch and fuse element, rear view.

Type DFS Metal-Enclosed Switchgear—*drawout fused switch*—provides compact, low-cost power switching for high voltage circuits in commercial buildings, institutions, and small industrial plants. DFS Switchgear meets a wide range of applications—with fault interrupting ability up to 250 mva at 4160 volts and 500 mva at 13,800 volts . . . load break rating 600 or 1200 amperes . . . full fault closing ability of 60,000 amperes for 5 kv and 40,000 amperes for 15 kv.

DFS Switchgear provides these major advantages:

Drawout design assures completely safe switch inspection and fuse replacement.

Component design versatility meets a broad range of applications, including automatic transfer and remote control.

Simplified metal-enclosed construction presents compact, modern appearance.

Maximum service reliability assured by extensive High Power Laboratory design-proving tests.

For full information call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa., for Descriptive Bulletin 32-750. *You can be sure . . . if it's Westinghouse.*

J-61011-R1

Westinghouse

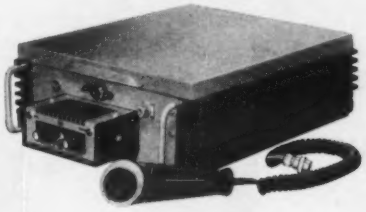
Wisely used transistors enhance the value of RCA "LD" 2-Way Radio and give it built-in dependability

In designing this efficient new "LD" equipment, RCA engineers wisely gave special consideration to the transistor. Only "stock" transistors capable of being serviced with existing test equipment and techniques are used—and only in circuits where they do the best job in cutting battery drain. Tubes are used where they can stand up under high temperatures, heavy voltages—jobs that tubes do best.

As a result the "LD" is not OVERtransistorized, is compact, yet accessible, miserly in power consumption yet value-packed to pack a punch in performance.

Leave the radio on when engine is off—battery drain is negligible. Use it on the roughest roads—transistors and sealed circuits give added assurance it can take it under gruelling conditions.

Specify the RCA "LD" and you can be sure it will stand in back of your endorsement. Lease or purchase plans available. RCA authorized service available. Ask your RCA Representative for complete descriptive literature. Or mail coupon below.



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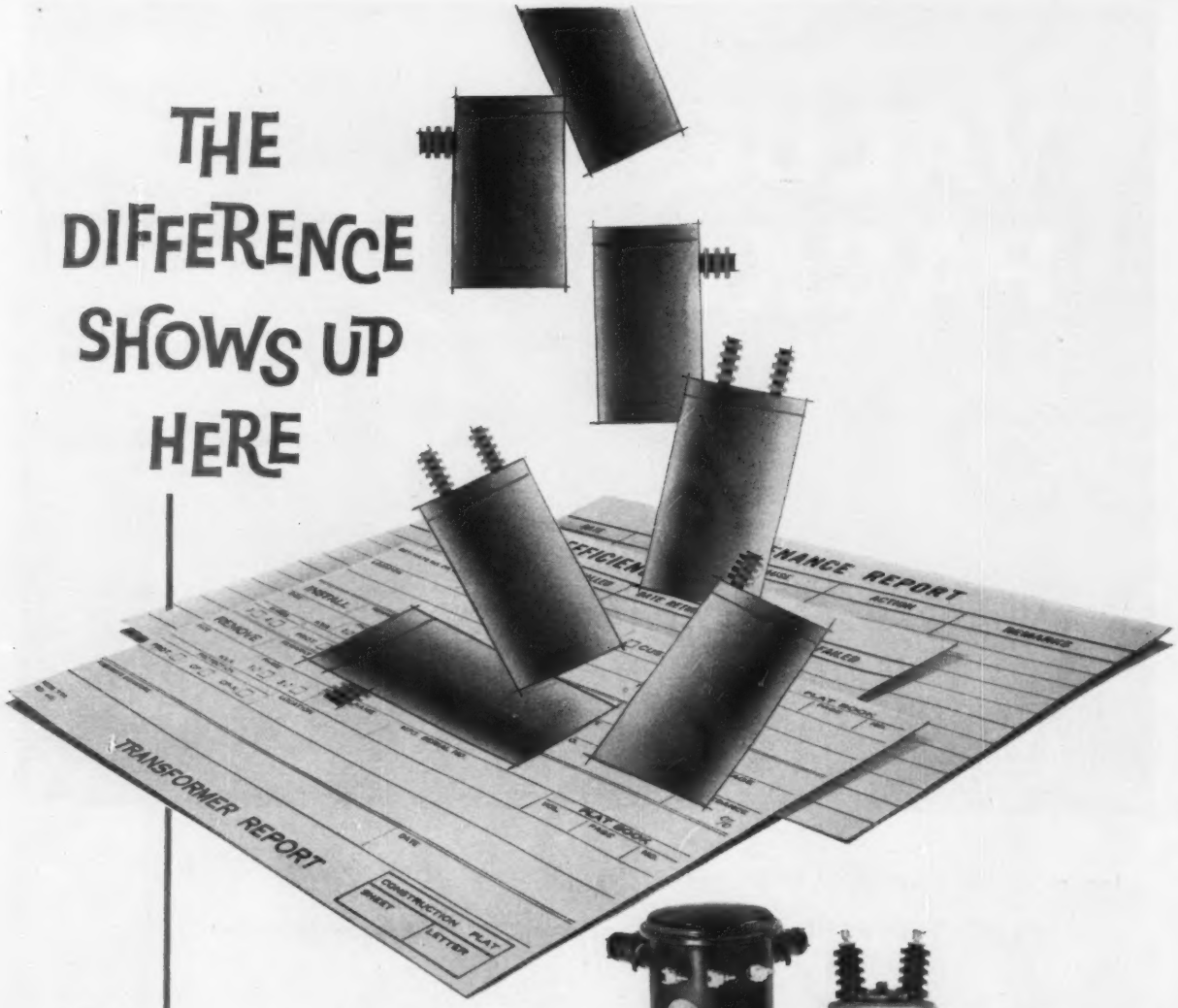

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Manufacturers of Transformers for Utilities, Industry and Electronic Applications

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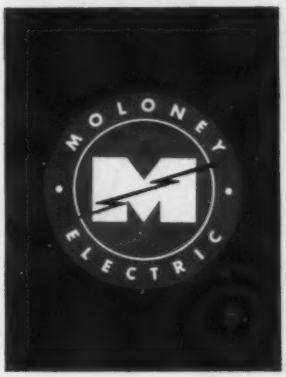

ME61-4

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Duracoat Insulated Covers • High Impulse strength Designed to withstand full short circuit Extra insulation at all vulnerable points of the coil	FEWER OUTAGES
High strength bushings • Sealed tank • Inhibited oil Tough weather resistant paint No external bushing mounting hardware Cover fashioned to shed moisture Heavy gauge steel tank and cover	MINIMUM MAINTENANCE
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Smoothly contoured hooks prevent sling abrasion AL-CU Connectors • Single bolt handhole closure Insulating cap on sidewall mounted H. V. bushings for clamping conductor without tools	QUICKLY INSTALLED
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3 reasons why General Electric Slimline is America's most popular 8-foot fluorescent

Any time you see a long, unbroken line of fluorescent light, chances are good it's a General Electric Slimline lamp. Over the years, the G-E Slimline has proved . . .

1. *Your customers can cut parts maintenance almost in half.* A G-E Slimline system has about half as many parts as a standard 40-watt system, yet it produces the same amount of light.

2. *Your customers get 5% higher efficiency* from General Electric Slimline lamps than from standard 40-watt fluorescents. They get more light for every dollar of electricity.

3. *Your customers can make their places look better.* Slimlines start instantly, with no blinking. They have an excellent record of uniformity and long life because of General Electric's outstanding quality controls and manufacturing experience. Available in all popular colors.

There are 14 combinations of tube length and diameter to fit anyone's space requirements. Recommend General Electric Slimline lamps on your next job. General Electric Co., Large Lamp Dept. C-13, Nela Park, Cleveland 12, Ohio.

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The nearsighted MISTER MAGOO says . . . "1945? Who could forget that year? Eagle-eye Magoo was mustered out of the Aircraft-Spotting Command, and General Electric invented the slimline lamp. Happy birthday, Slimline! Zounds —they don't make these telescopes like they used to!"

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of distribution lightning arresters

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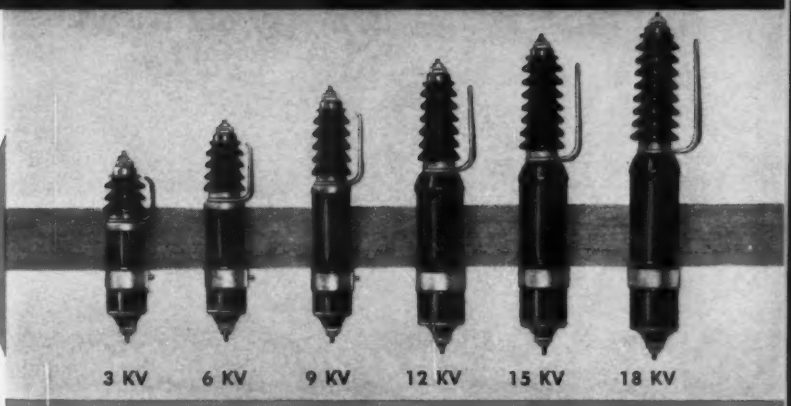
The right arrester for the job where frequent and severe lightning occurs, but where system short-circuit currents are moderate. The ideal arrester for rural areas.



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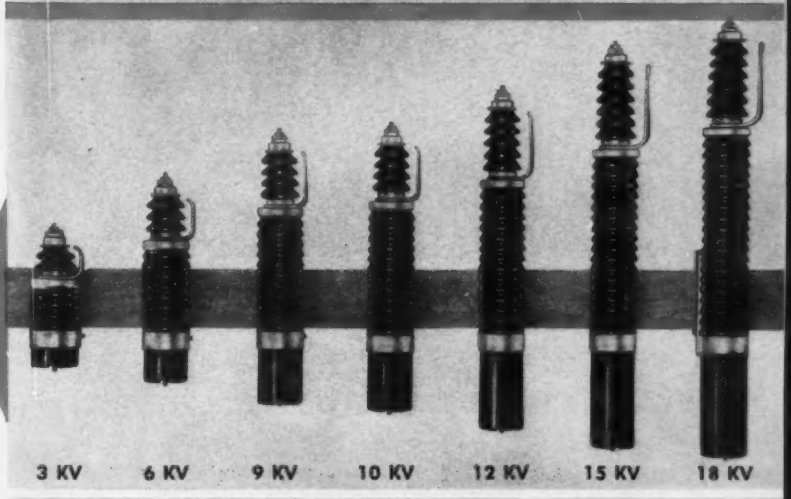
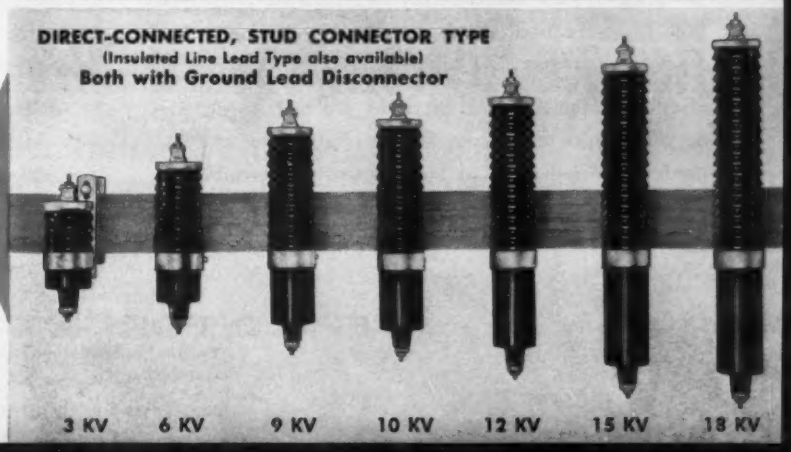
The arrester to use where high system short-circuit currents exceed expulsion arrester capacity, but where less severe lightning currents occur. The ideal arrester for dense urban areas.





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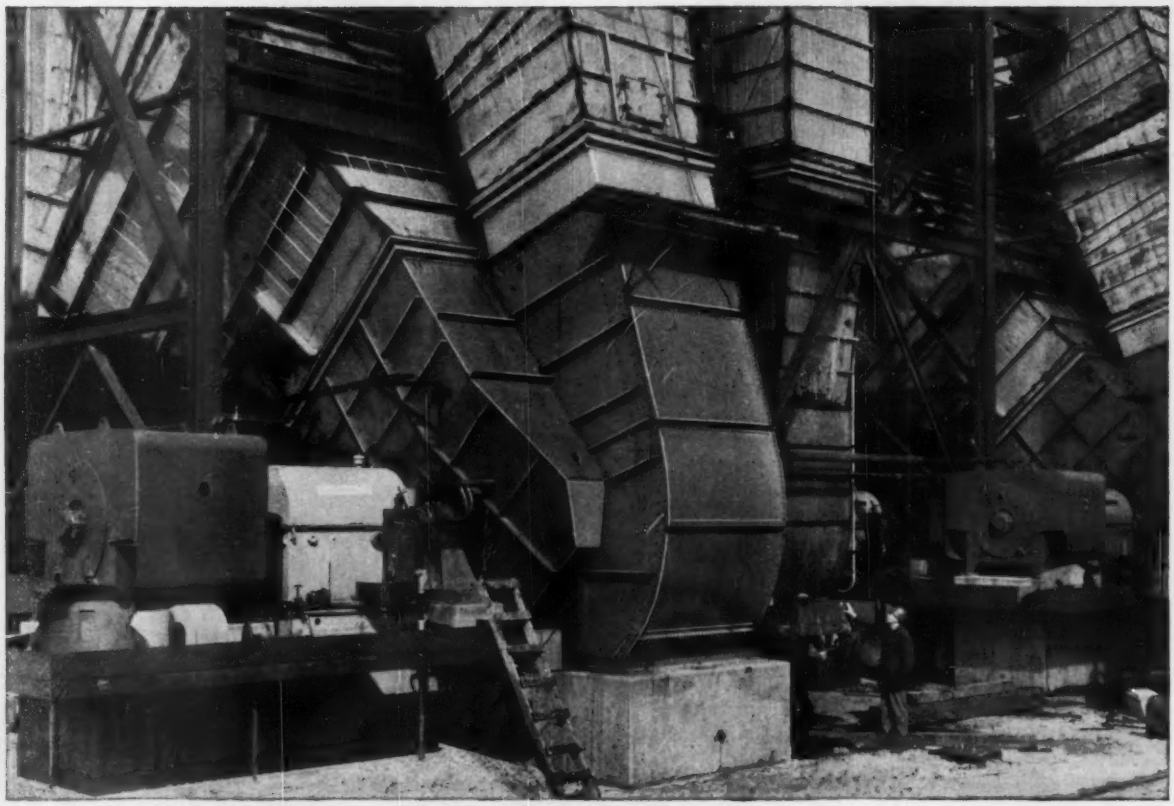

HOW DO YOU SELECT MECHANICAL DRAFT FANS?

By price alone? Undoubtedly not because proper fan performance cannot be obtained by cut-rate methods. It must be engineered and built to a standard, not a price.

"Buffalo" Mechanical Draft Fans are built to an engineering standard with over 80 years experience and hundreds of installations to back it up. This engineering experience combined with "Q" Factor* construction makes the complete line of "Buffalo" Mechanical Draft Fans a best buy in the long run.

Be sure to phone your "Buffalo" Engineering Representative when you want reliable, high efficiency, long life mechanical draft fans.

*The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

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'Buffalo' air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

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Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

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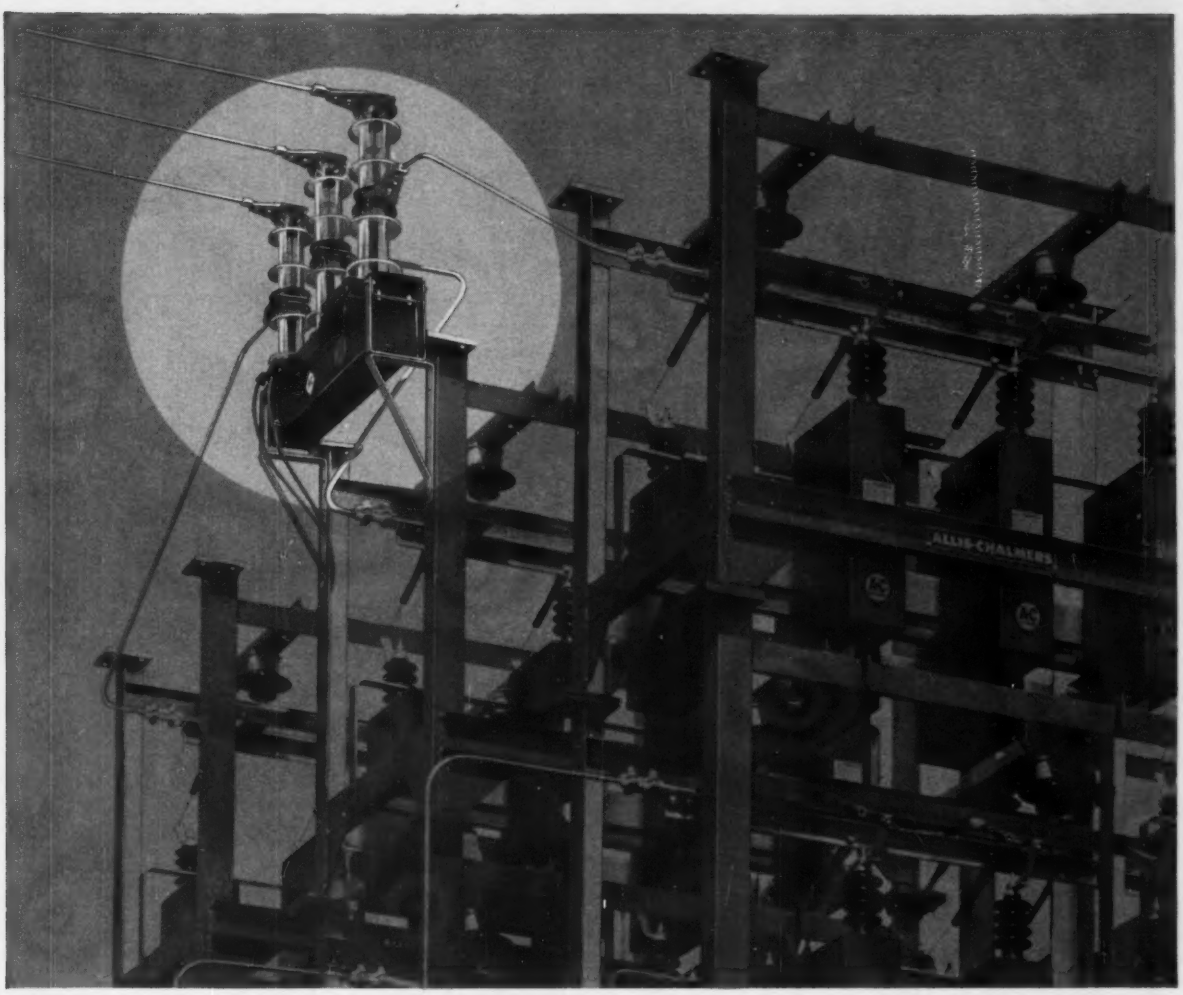


Now...a low-cost vacuum capacitor switch

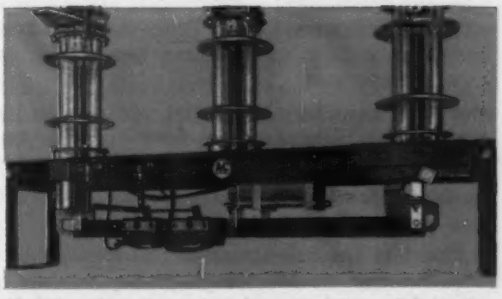
Restrike-free... lightweight... reliable

Competitive with conventional oil switches... this new 14.4-kv, 300-amp Allis-Chalmers three-phase vacuum switch is specifically engineered for capacitor duty. It operates from ac or dc, manually or by fully automatic control as the system demands. You get restrike-free performance, reliability and maintenance-free operation. Weight is one-third that of oil-type switches.

Resistance to physical damage is just as spectacular. Point-blank, 22-long rifle fire failed to penetrate the tough Plexiglas protective housing. The vacuum tubes withstood pressure tests in excess of 20 times normal closing forces.

For more information, contact your nearby A-C office. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

A-1409



How it works — Front view shows capacitor switch mechanism housing with cover removed. When coil is energized, solenoid plunger moves connecting rod through cam to close the contacts.

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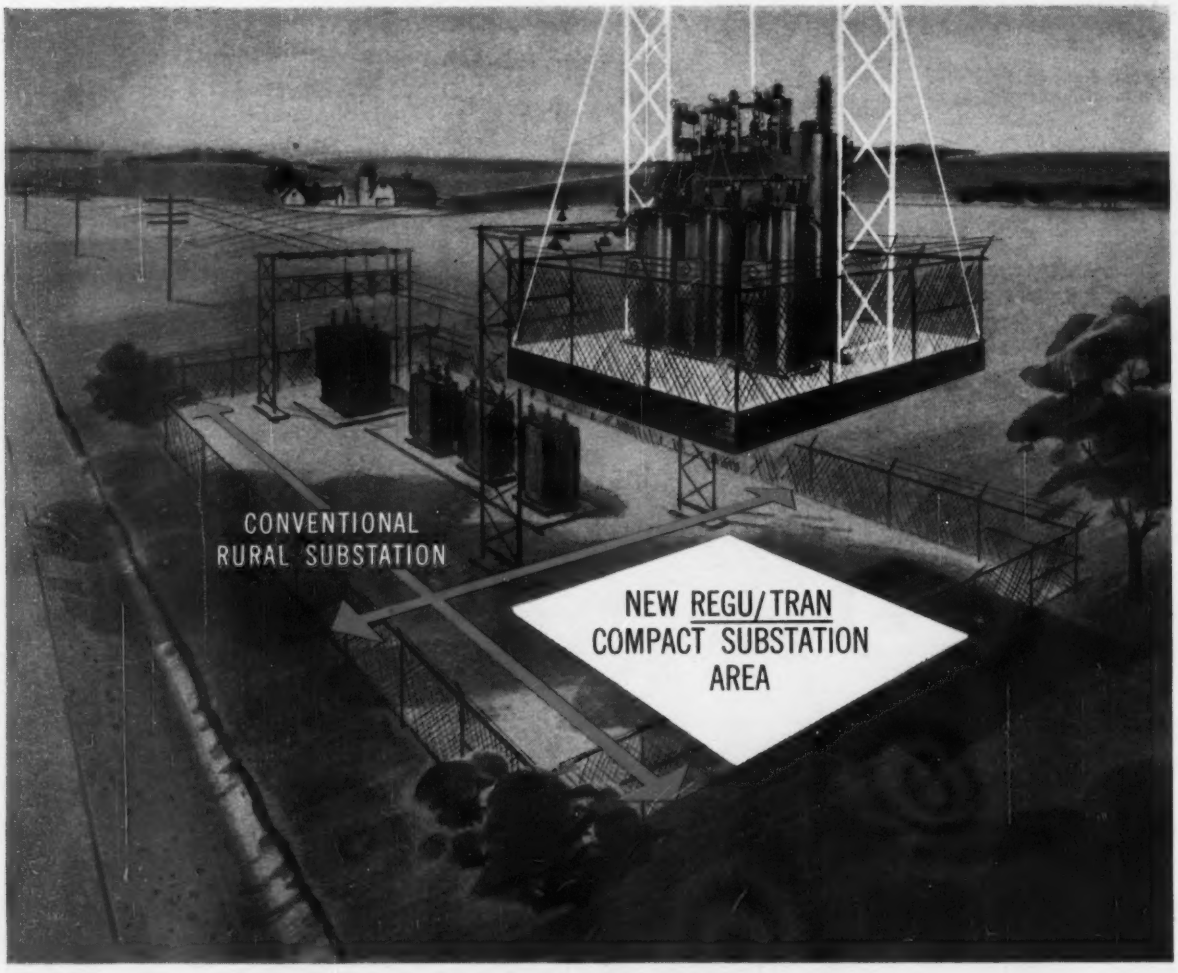


Space – just one of many savings!

A complete, compact substation package from Allis-Chalmers!

You get guaranteed performance and the economy of a standardized item. *Regu/Tran* compact substation requires only 25% of the area needed by conventional rural substations.

More savings! Buy the entire package on just one purchase order. Shipments are dovetailed to your construction schedule. All parts are keyed to master drawings.

Designed for future load growth! All structural members are punched for adding H.V. and L.V. bays later.

Heart of the substation is the *Regu/Tran* unit. This new concept provides single-phase regulation with provision for safe by-passing of regulating equipment without dropping the load. A-1442

Regu/Tran is an Allis-Chalmers trademark.

Regu/Tran compact substation vs conventional

1. Just 1 mounting pad instead of 3	**2.** 4 piers instead of 6	**3.** 13'9" x 22' compared to 24'x62'
4. Requires just 25% of the real estate formerly needed	**5.** Cuts fencing needs in half	**6.** Requires considerably less grounding material
7. Less interior gravel or rock surfacing	**8.** Preassembled main structures cut erection time	**9.** Regu/Tran unit can be replaced with larger unit later without changing structure

Ask your nearby A-C office for Bulletin 61B9756 or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Editorial Comment

APRIL 10, 1961

A Weak Approach to Industrial Development

Robert Moses, chairman of New York State's Power Authority, has come up with another twist on his perennial plea for legislation that would let the Authority build atomic plants in New York with federal aid. We don't like this one either!

This time (he's failed twice before in similar attempts) he offers the bold excuse that the NYSPA "could produce atomic power 25% cheaper than private companies." And he goes on to plead for "the earliest possible development of low-cost atomic power to overcome the competitive advantage of other states which have an abundant supply of cheap power and are using it to lure industry away from New York."

In his memorandum to Gov Rockefeller, Chairman Moses notes that in an investor-financed plant, fixed charges equal about 14% of the total cost and that federal income taxes take 52% of the profit. On the other hand, Moses says, the Authority's fixed charges are only half those of an investor-owned plant.

It's interesting, at long last, to see that at least one leading exponent of federally-financed power recognizes its inherent inequities.

But it's distressing to find one, otherwise so well informed, using federally-financed power projects as a bludgeon against one of the state's biggest taxpayers and to see this done in a move designed to "lure" other tax-paying industries into the state. Such actions can hardly be expected to build confidence on the part of tax-conscious industry considering plant locations in the state.

If Chairman Moses really wants to build state revenue and attract new industry perhaps the way to do it is for the Niagara and St. Lawrence projects to contribute their proportionate share to the state coffers.

Meanwhile, Mr Moses, it would be more fitting to compliment the investor-financed utilities in your state for the excellent job they are now doing not only in the development of atomic power but also in the integration of the state's present power resources and in industrial development.

Today's Technology Needs the Special Conference

Again this year three days of concentrated power plant education have been packed into the recent American Power Conference. Well bracketed were the areas of interest to power plant engineers today—automation and controls, computers, atmospheric pollution, peaking, water technology, nuclear stations, and supercritical units. These areas embrace most of today's power plant problems.

This conference fits closely the modern concepts of professional meetings so often expounded by AIEE President Clarence Linder. It is Linder's view that more meetings should be centered around a single focal point, with engineers from all related branches attending and participating. In the case of APC the focal point is principally power generation. Engineers of all disciplines concerned with power plants—civil, mechanical, electrical, and chemical—attend.

The sponsors of the American Power Conference are to be congratulated on their choice of problem areas as well as their concept of technical meetings.

This year, again, papers at APC were characteristically of a summary or history type rather than original theory or engineering. While some observers wish there was more original material, this is not a serious handicap because the historical or summary paper serves to consolidate technical knowledge in the area.

The continual year-after-year success of the American Power Conference leads us to suggest that similar special conferences are needed in other areas. Why not an American Distribution Conference or an American Transmission Conference?

FPC Okays Hanford Generation

Economic feasibility review gives qualified confirmation of earlier, favorable reports—with lower price tag

The Federal Power Commission, in a report that is now in the hands of the Joint Committee on Atomic Energy, gives heavily qualified confirmation of the economic feasibility of converting the Hanford plutonium New Production Reactor (NPR) to dual purpose use for generation of electricity.

The report (an updated edition of one made last year) gives $95 million as total cost of adding generation facilities, but this does not include $25 million already being spent for convertibility features that are included in the cost of the $145-million reactor.

Plutonium Price Important

Latest FPC findings are that NPR nuclear power will be no more costly than fossil fuel or hydro power if plutonium continues to be needed (a disarmament agreement could effectively cancel major plutonium requirements) and its prices remain stable. Total costs of operating the NPR are classified to protect US plutonium production figures, but FPC says costs will not exceed the value of power produced. Should forecasts of long term Northwest power area requirements fail to measure up, felt by FPC to be a reasonable possibility, value of NPR power would also decrease and feasibility could conceivably be overturned.

The at-site values put on Hanford power based on steam-electric costs over a 33-year plant life was $12.06 per kw-year for capacity and 2.35 mills per kwhr, or $20.59 per kw-year for energy for the first eight years of dual-purpose operation. For the remaining years of power production only, a capacity value of $9.60 per kw-year and energy values of 2.87 mills per kwhr or $25.14 per kw-year were estimated.

Costs of hooking on power production generators are now $17-million less (change from $104-million to $87-million) than FPC estimated last year. The reduction is because turbine generator vendors say the 786-Mw maximum plant capacity can now be delivered by two 393-Mw units instead of the three units earlier thought necessary. The difference between this and the total cost figure is escalation allowance for increased construction and equipment costs over a period of years.

Other changes in the FPC updating report from the report it prepared in February 1960 are:

- The plant factor of NPR during the 1964-72 dual purpose operation period will drop from 40% computed last year to 30%. The decrease in energy that NPR is required to furnish in its first few years is because of increased storage of water for the Columbia River Basin as a result of the US-Canada treaty, and decreasing load estimates in this period. This means the NPR energy at a 30% plant factor will cost more than alternate steam-electric power.
- Plant factor goes up to between 45 and 70% however, based on latest Bonneville Power Administration load estimates which add 400 Mw of firm power beginning in 1963 which BPA cannot sell without assurance of NPR power. NPR value would be further enhanced by construction of a $200-million California intertie which would substantially increase marketability of the Hanford power.
- Effect of all changes since last year's study apparently adds a greater degree of economic feasibility for making NPR a power production facility—though FPC also warned against regarding the additional load estimates as assured.

The estimated power requirements for the Pacific Northwest area adopted for use in the NPR feasibility study, 1960 through the year 2000, range from 53,663 thousand Mwhr energy and 9,200 Mw peak to 340,520 thousand Mwhr and 55,697 peak.

FPC also concluded that the most economic reactor would be one of 650-Mw capacity during the 1964-72 dual-purpose period of power and plutonium production, and 763-Mw capacity in the 1972-97 power-only period. All 22 reactor schematic arrangements investigated by Burns & Roe, Inc, architect-engineer consultant to the FPC study, with electrical capacity ranging from 271 to 842 Mw, assumed a reactor life of 35 years.

The updated estimates completed by FPC for the Atomic Energy Commission, in addition to five other feasibility studies on NPR convertibility-to-power economics, is contained in a report just released by the Congressional Joint Committee on Atomic Energy. The background report will be used in coming Congressional action to authorize construction of the generating facilities, recommended by President Kennedy's recent amendments to the AEC budget for 1962.

Administration Favors Plan

Kennedy asked Congress for $30.1-million to start construction on the power plant this year.

Secretary of Interior Stewart Udall and Bonneville Power Administrator Charles Luce give their strong endorsement to the NPR power project. In letters to Sen Henry Jackson (D-Wash.) included in the background study, both urge NPR convertibility as a means enabling Bonneville to market an additional 400-Mw of firm power and to protect against power shortages in the events of a critical water year in 1965-66.

Udall also noted the $25 million already incorporated in the NPR reactor design to be used in conjunction with an electric generating plant. "Unless this plant is built, this $25-million will be a total waste," he said.

In 1958 when the convertible reactor construction was voted, Sen Clinton P. Anderson (D-N.M.), who was then chairman of the Joint Atomic Committee, averted a fight to eliminate the convertibility features of the reactor by pledging that its power would not be subject to preference clause sales.

REA Figures in Depressed Areas

Rural area development would provide vehicle for broader function of REA or REA-type agencies in industrial service

"Rural area development," with rural electric systems taking a key role, moved forward last week on several fronts.

• The House joined the Senate in approving (250-166) a $394.5-million "Depressed Area Redevelopment" bill (S-1) which includes $100 million in loans to rural areas. The bill would set up an area redevelopment administrator in the Commerce Department to administer the funds, but Commerce Secretary Luther Hodges has indicated he would "lean very heavily" on the Agriculture Department for recommendations on rural loans.

This bill must go to a Senate-House conference committee to iron out differences in financing the program, as passed by the two bodies. President Kennedy is certain to sign it. (The Senate passed the measure earlier 63-27.)

• Agriculture Secretary Orville Freeman has set up in his department a "Rural Areas Development Board," headed by John Baker, agricultural services director. This new board, representing the Rural Electrification Administration and ten other agriculture agencies, will set up a new program "to stimulate local initiative to develop more jobs" in rural areas, says Freeman. "We know that a program of this type will help promote new industries in areas where a factory is the breath of life to a whole county."

Freeman's newly created board probably will act mostly in an advisory capacity. A rural areas development staff, headed by John Lovorn (previously with the Farmers Home Administration), will do actual work for the board: **(1)** Recommend areas for attention, **(2)** Maintain liaison with the Commerce Department and other federal agencies, **(3)** Review and schedule all development programs of the department.

REA possibly will be named specifically to handle the job of working directly with local rural interests—through its system borrowers.

• REA Administrator Norman Clapp emphasized that "much of the task of creating greater opportunity in rural America must fall to rural electric co-ops," in a talk before the Wisconsin Electric Cooperative, Madison, Wis.

"Industrial development, in my opinion," said Clapp, "should not be confined to the business of enticing ready-made industry to come into our communities from the outside. Perhaps the greatest contribution we can make will be in stimulating new enterprise . . . many of us have talked hopefully in the past of applying the REA approach to other farm service needs in the interest of a sounder agriculture."

Clapp explained how rural electric systems could carry out the Kennedy Administration's plans for rural development: **(1)** "First, you can assume leadership in forming local community development committees . . . once an industrial development commission has been formed in your area, you can give it your time, your energy, your experience, and your imagination; **(2)** You can be ready to work with other electric cooperatives in taking an area-wide approach to mutual problems; **(3)** When necessary, you can help raise money" for local development programs; **(4)** "When you have to, you can go it alone."

Conference Set for Mid-May

• General Manager Clyde Ellis of the National Rural Electric Cooperative Assn has set up a "Rural Areas Development Conference" in Washington, D.C., May 14-15. NRECA says local system officials have indicated "keen interest" in the conference, and a couple of hundred leaders are expected to attend the conference.

The $100-million loan fund for rural development is part of $300 million authorized for loans in the bill. The remaining $200 million is divided equally between industrial area plant loans and public facility loans. In addition, another $75 million in direct federal grants is provided for public facilities.

The "public facilities" reference caused concern earlier to utility leaders, who saw in it an opening for federal mine-mouth generating plants in the depressed Appalachian coal-mining areas. An early Democratic report called for such plants.

Language in the bill, as passed by both sides of Congress, prohibits financial assistance, however, "to any public facility which would compete with an existing privately-owned public utility rendering a service to the public at rates or charges subject to regulation by a state regulatory body, unless the state regulatory body determines that, in the area to be served by the public facility for which the financial assistance is to be extended, there is a need for an increase in such service (taking into consideration reasonably foreseeable future needs) which the existing public utility is not able to meet through its existing facilities, or through an expansion which it is prepared to undertake."

Fund Called a "Boondoggle"

An alternate redevelopment bill, introduced by Rep William Widnall (R-N.J.), was beaten in the House 291-125. The Widnall measure would have deleted the $100-million rural loan funds, substituting a $500,000 study to determine a "workable" rural program. Widnall charged that the $100-million loan fund for rural areas is "a bribe and a boondoggle for the rural sections, because nobody knows where it is going to be used." Hodges also had testified during House committee hearings that the bill's wording "is not as clear-cut as would be desirable." And Freeman said at the same hearing that the bill had no limitations for rural development: "I think this (bill) allows discretion as to that (limitation) on the Administrator."

Clapp told the Wisconsin co-op group that "While adequate power to drive machines once had been available only in population centers, it is now available in every corner of the US . . . The production resources which once created our big cities now are available everywhere."

B.C.-Ottawa Dicker on Columbia Projects

British Columbia has told Ottawa to either build and pay for the $458-million Columbia River development itself or guarantee B.C. it will receive 4.25 mill power at Vancouver and permission to export surplus Columbia power to US.

These were the alternatives placed before federal Finance Minister Donald Fleming by B.C. Premier W.A.C. Bennett when they met in Victoria to open talks on methods of financing the Columbia River project. It was the first time Bennett had offered the federal government the right to go ahead on its own so it could meet requirements of the Canadian treaty with the US.

If Ottawa should decide to go it alone, Bennett would insist on these stipulations:

- Ottawa would build all dams and transmission lines and pay for them.
- Ottawa would pay "generous" compensation to flooded B.C. residents.
- B.C. would keep the $64-million flood control cash benefits from US, hold them forever, and use only earnings on them as compensation for economic damage caused by flooding.
- Ottawa would pay engineering costs of $4 million already authorized for B.C. energy board investigations.
- After 50 years, or earlier if the project is paid for sooner, the dam and lines would be given free to B.C.

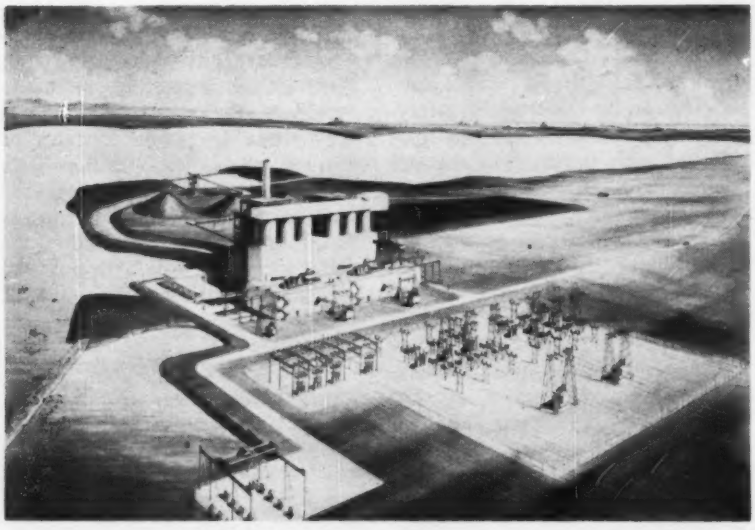
Bennett's other alternative was even more stringent and warned that B.C. would not accept federal control of its major resource:

- B.C. would build and pay for the dams and lines.
- Ottawa would have full access to engineering data, and "scrutinize and approve all contracts."
- Ottawa must guarantee "by appropriate financial measures" that the net cost of Columbia power delivered to Vancouver will not exceed 4.25 mills.
- Ottawa would arrange with US for sale in US of any B.C. surplus Columbia power at not less than 4.25 mills.

Prime Minister John Diefenbaker and Justice Minister Davie Fulton are both on record as saying that power can be delivered to Vancouver for four mills. Now B.C. has given them leeway to 4.25 mills.

Neither Bennett nor Fleming commented specifically after the two sessions in Victoria, but Fleming said there would be further exchanges on plans for the project. Bennett was extremely pleased.

Bennett said B.C. offers were not restricted to those mentioned, and that talks will continue. But he didn't expect any formal decision to come from them.



Ground Broken for APS 350-Mw Plant

A dynamite blast recently signaled the beginning of construction of Arizona Public Service Co's $62-million Four Corners generating plant. The 350-Mw mine-mouth plant, to be built on a coal-rich Navajo reservation, will send power into the Phoenix area on a 300-mile, 345-kv line. APS is discussing a possible connection between Four Corners and Glen Canyon with the Bureau of Reclamation.

Triggering the blast, which began work on a dam to store water for the station, were officials of Arizona Public Service, Utah Construction & Mining Co, and the Navajo tribe. Utah Construction, which will do foundation work on the plant and storage dam, holds leases with the Navajo Indians to mine coal from their reservation.

Four Corners plant gets its name from its location near the point where four states (Arizona, New Mexico, Colorado, and Utah) come together. The site was selected because of the abundance of coal to feed the two boilers powering a pair of 175-Mw turbine-generators. At full load, the furnaces will consume 4,200 tons of fuel a day. In addition to the coal, natural gas will be used for lighting off, and for flame stabilization at low loads.

The boilers will operate at a pressure of 1,925 psi, and steam will be 1,005F at the superheater outlet, with a continuous steam output of 1,270,000 lb per hour.

An artificial 1,200-acre lake will supply the cold water to condense the steam. Two pumps, each rated at 15,000 gpm, will lift water from the San Juan River five miles north of the plant. Pumping will start in October 1961 in order to have the lake ready for plant operation in 1963. Lake water will be re-used.

Navajo Indians anticipate great benefits from the project. In addition to $250,000 in annual royalties for mining privileges, Navajos expect to use the power to bring industry to their reservation.

Automated Units at Huntington Delayed

Technical problems have delayed the start of commercial operation of Southern California Edison Co's computer-automated turbogenerator units at Huntington Beach, Calif.

The 210-Mw third and fourth units at Huntington Beach station are the first of their kind to be completely computer controlled. Although Edison would make no official comment on the delay, one source characterized it as "attributable to the normal developmental problems that might be expected in pioneering a new application of this type."

The third unit, which had been scheduled for completion in December 1960, is now expected to go into operation by mid-April. Unit No. 4 which was targeted for completion in July 1961 is now scheduled to go on the line in mid-October.

Computers Scan 1,000 Checkpoints

Each of the units is to be controlled by a General Electric Co general-purpose, stored-program, solid-state digital computer. These devices automatically start up and stop the turbine generators, monitor the operations of all major equipment in the station, scan conditions such as pressure levels, water levels, temperature and flows at 1,000 points on each of the units, and perform calculations to determine whether the units are operating at maximum efficiency. The apparatus can scan up to 300 checkpoints a sec, and its magnetic storage drum will have a permanent memory of 16,000 words.

One of the principal problems, it is reported, is in application of the computer to control the variable pressure conditions of the boiler. The combination of the new computer and the new type of boiler has apparently uncovered design problems which had not been anticipated.

In an effort to eliminate the existing bugs, Edison is currently limiting operation of its newest unit to start up and shut down.

Kennedy Backs TVA's New Plant Site in Tennessee

President Kennedy apparently has backed the Tennessee Valley Authority directors' choice for a new steam generating plant at the Edgemoor site on the Clinch River just west of Knoxville, Tenn.

"The capital saving of $30 million (over an alternate site in Kentucky) would seem to provide a firm base for your decision," he wrote to the TVA chairman, Gen Herbert Vogel.

Sen John Cooper (R-Ky.) had urged the President to use his influence to have the plant built in eastern Kentucky, on the Cumberland River—a labor surplus area.

The TVA board, however, pointed out to the President that the Tennessee site also is in a labor distress area. Two deciding factors for Tennessee, said the board, are:

- "The most economical production of power" could be achieved there;
- An availability of surplus skilled labor could be used in the Knoxville area, while skilled labor would have to be imported into the Kentucky area.

"I want to feel that in your future thinking on the continuing problems of the valley region," Kennedy told Vogel, "you will be giving thought to the problems which go beyond the production and sale of power."

Power & Light Exhibit Site Selected

J. A. Panuch, vice president of the 1964-65 New York World's Fair, points out the site of the proposed Power & Light Exhibit to executives of Power & Light Exhibit, Inc. They are left to right: H. S. Sutton, Consolidated Edison Co; Edwin Vennard, Edison Electric Institute; G. S. Landrith, P&LE, Inc; Panuch; C. M. Vandeburg, president of VEK Associates Inc, designers of the exhibit; E. R. Acker, Central Hudson Gas & Electric Corp; and C. R. Bozek, P&LE, Inc.

The display will occupy a 45,000-sq-ft site at the intersection of two of the Fair's main traffic arteries. Power & Light Exhibit, Inc, expects to be able to announce the principal features of the project by the middle of this year.

TVPPA Told Taxes Are Hindrance

Chattanooga delegates hear TVA officials urge distributors to build larger but fewer distribution systems

Local governments tax electric service more and more, but use the tax receipts for purposes other than improving that service, the Tennessee Valley Public Power Association was told at its 15th annual convention, March 20-21, at Chattanooga, Tenn.

Growth in the use of power in this Tennessee Valley is retarded by such increasing taxation, said G. O. Wessenauer, TVA manager of power, in urging TVA power distributors to resist further taxation.

Urges Larger Systems

Wessenauer urged distributors to build larger but fewer distribution systems in the TVA area. He also noted that the price TVA paid recently for two 900-Mw turbine-generators was only slightly higher per kva than what was paid as long as two decades ago for a 60-Mw unit.

"Price," he said, "is not the whole story. The new units will have much higher efficiencies than that of the 60-Mw Watts Barr unit."

Speaking on price trends in generating equipment, Wessenauer said that in late 1958 TVA took bids on a 500-Mw unit and invited an English company to bid. The English price, he said, was about $24 per kw in contrast with the lowest domestic bid of $35 per kw. The contract went to the foreign manufacturer.

Foreign Bids Lower

Similarly, a 1959 contract went to a Swiss firm, he said, because its price on a 500-Mw unit was $17 per kw. Subsequently, two 650-units and two 900-Mw units were purchased from domestic manufacturers for $25 per kw and $20 per kw, respectively.

W. E. Hooper, TVPPA president and manager of the Power, Water, & Gas Department, Sheffield, Ala., recommended that distributors improve service continuity and voltage regulation in preparation for ice storms like those that struck the Alabama area a year ago."

"Under private ownership," he said, "too much attention has been given to profits, and under public ownership to low rates.

In reviewing President Kennedy's appointments, J. B. Brown, American Public Power Association, noted that many appointees are friendly to TVA. But the wall built around TVA by the investor-owned companies with reference to the self-financing law, he said, has served only to excite more areas to want TVA power and to prod Congress into changing the TVA regional limitations.

Storm Insurance Studied

Ice storms that a year ago virtually wiped out many local distribution systems have taught distributors a few lessons, said J. W. Johnson, Albertville (Ala.) Utilities Board. One lesson, he said, is that larger conductors, shorter spans, and heavier guying anchors help a distribution system to survive.

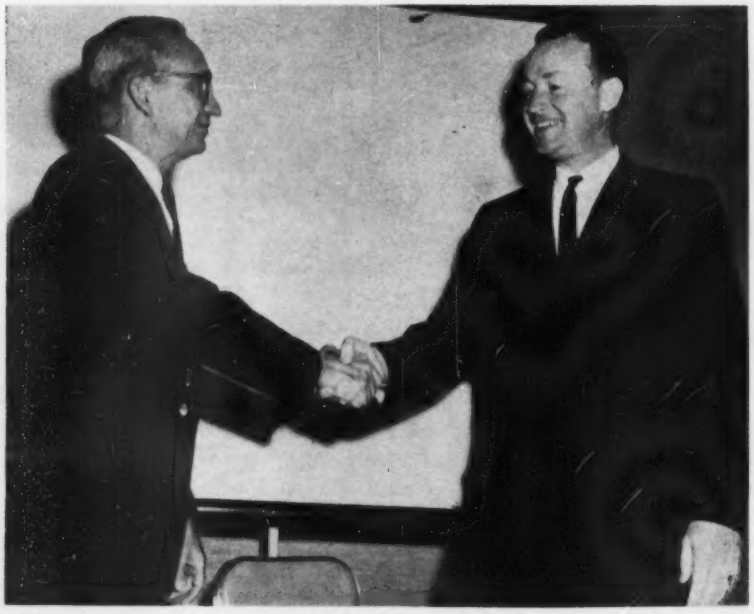
Johnson urged the use of triplex and quadraplex and the elimination of weatherproof services. He also cited the need for catastrophe insurance.

Ray B. Slagle said that the insurance organization carrying his name was working on a catastrophe insurance policy for power systems and may be ready to offer it before the next winter.

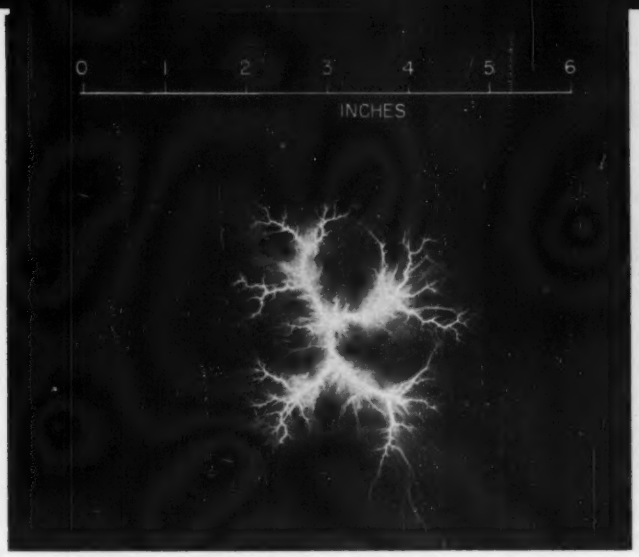
Law Is Effective

Tennessee's 1955 law requiring 6-ft clearance has helped to reduce deaths, injuries, and damage claims from contacts of cranes and other construction equipment with high-voltage lines, said J. H. Harrison Jr, Chattanooga Electric Power Board.

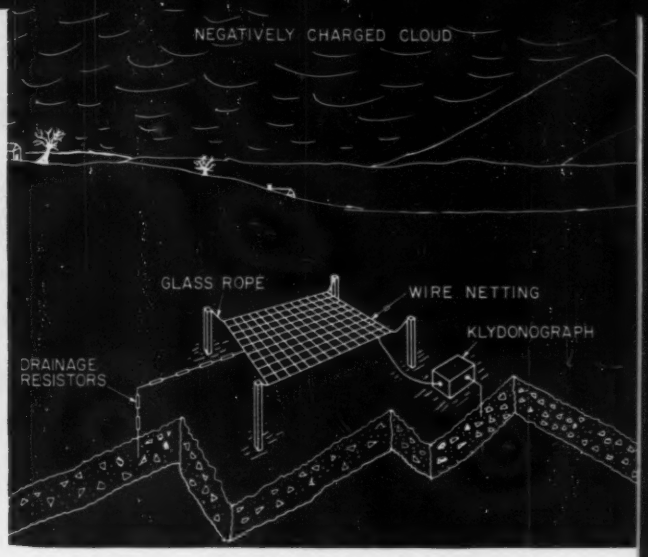
Frank Price, Magnolia Electric Power Association, McComb, Miss., reported that the Federal Communications Commission has approved the use of radio for reporting outages and switch openings via coded messages and the sending of coded messages for switch reclosings.



W. E. HOOPER, left, outgoing TVPPA president, congratulates Wesley M. Jackson, manager of the Tennessee Valley Electric Cooperative, who is the newly elected president. The TVPPA met March 20-21 at Chattanooga, Tenn.



ELECTRIC FIELD INTENSITY of about 2,500 volts per inch is revealed by one of 16 films obtained during 1960



KLYDONOGRAPH MEASURES bound charge of wire netting, when cloud is discharged by flash to ground

Tests Reveal High Electric Fields

Klydonograph used in new technique shows field intensities to be three times previous recorded maximums

S. B. GRISCOM, Advisory Engineer, Electric Utility Engineering, Westinghouse Electric Corp, East Pittsburgh, Pa.

A new method of recording the electrostatic field intensities during thunderstorms, devised and put in operation during 1960, shows three times the maximum electric field intensities previously recorded. This method combines two concepts, each nearly 40 years old.

First, it uses the concept of the old "induced stroke theory" once thought to be the major factor in causing transmission line flashovers due to lightning. Actually, there was no fallacy of reasoning in the old theory, and its abandonment came about only because improved data and calculations showed the voltages to be insufficient to cause flashover in most instances.

The method of obtaining the voltage to be applied to a klydonograph is shown in the drawing. The wire netting, connected to ground via a drainage resistor, remains at essentially ground potential as a thundercloud slowly drifts over the test instrument location. Then, if the cloud is discharged by a lightning flash to ground, the induced charge becomes a bound charge, manifesting itself as a voltage between the wire netting and ground.

The klydonograph, described by J. F. Peters in *Electrical World*, April, 1924, is suitable for recording the voltage induced on the wire netting. However, the recording range of the original device was about 3 to 20 kv. Since it is desirable that the recording range be as large as possible, some modifications of the klydonograph were made to extend the range to about 3 to 60 kv. Installations in an open field have obvious shortcomings because of the shielding effect of trees and shrubbery, and the difficulty of finding sites not subject to vandalism or pilfering. Accordingly, the three installations were made during 1960 on top of buildings as follows:

1. Cathedral of Learning, University of Pittsburgh, installed May 3, 1960.
2. The Westinghouse L-Building, East Pittsburgh, installed June 24, 1960.
3. Westinghouse Research Laboratories, Churchill Boro, installed July 22, 1960.

To date, 16 films containing records have been obtained. Allowing for the fact that there was an average of only about two instruments for the entire season, this means about 12 film records per device in a lightning season which was notably light with respect to thunderstorm activity. The devices as installed did not utilize film transport, so that nearly every film had more than one Lichtenberg figure. Approximately 80 figures were counted, making an average of about five figures per recording. The installations are about four miles apart on a nearly straight line. It was found that thunderstorm activity in the vicinity of one test site would not produce a record at the adjacent test sites. Preliminary analysis indicates that the intercept area of a test site is two miles or less.

One of the records obtained is shown in the photograph. Characteristically, this involves the superposition of several Lichtenberg figures. Calibration data is incomplete at this time, but the maximum amplitude shown on the photograph is believed to give an electric field intensity of about 2,500 volts per inch. This is about three times the maximum electric field intensity recorded during other investigations here and abroad.

This method of obtaining electric field intensities has many advantages, and further investigations are planned.

This Month In Europe:

Top British Transmission Men

With EHV moving into g. :r prominence each week in the US, *Electrical World* this month takes a look at a major European development, the upgrading of the British Grid to 400 kv by the Central Electricity Generating Board. In the following interview with **J. H. M. Sykes**, EW's Overseas Engineering Correspondent, **W. Casson**, the CEGB's Chief Transmission Design Engineer, and **D. G. Cherry**, Transmission Plant and Equipment Engineer reveal some of the design details and reasons for selection of 400 kv as the new grid voltage.

J. H. M. Sykes: Engineers all over the world have been extremely interested to hear that Central Electricity Generating Board (CEGB) in Britain, is to raise its main transmission to 400-kv. But recently the Board said "An investigation is in progress to determine whether the next step should be to uprate suitable sections of the 275-kv supergrid to 380 kv or alternatively to leave the existing system operating at 275 kv and to superimpose a further system at a considerably higher voltage, possibly 500 kv or 550 kv." Has some particular research development in recent months made it possible for you to say that no further major research would be needed, and that you were completely satisfied that 400 kv would be workable here?

W. Casson: Well, . . . let me give you the general background. We thought that 275 kv would suffice our needs for a long time when it was first introduced in 1951. When we introduced a 275-kv heavy duty line, the decision was made to increase the dimensions of the towers to provide for future uprating to a higher voltage. . . . We hoped it might be 400 kv, like the Swedish system which had then just been commissioned. But we didn't know when we would need this 400-kv level. . . . We were still in that frame of mind until about a couple of years ago. The factors which. . . . made us think about the next highest step are the size of new generating stations, and the size of the individual sets, and also the locality of generating stations relative to the load centers. There's also the amenity problem, the difficulty of getting overhead line routes, and the need to transmit the largest amount of power possible through any one route.

The West Burton generating station, in the Midlands of England, was approved with a first section of four 500-Mw sets. So we required a further line between the Midlands and between the South—about 150 miles—and the question was. . . . whether we should construct a line of the standard 275-kv construction or whether we should go in for something heavier—much heavier. . . . [We were concerned with] a bulk transfer, from the Midlands, of something over 2,000 Mw, perhaps up to 3,000 Mw through the four double-circuit lines. . . . We needed that additional line. . . . because there had been a sudden change in the generation program, which resulted in more conventional type plant being installed in the Midlands area. . . .

Sykes: In view of the CEGB's position that they needed further research on the operation of 400-kv in Britain, would you elaborate on why you feel you can now safely establish it? Is there some one step or research result which gave you the 'all clear'?

Casson: No—no one particular factor. We had been doing research at our Leatherhead Testing Station on 400-kv insulation for seven or eight years, and we realized that there would be some difficult problems. . . . , so we were in some position. . . . to say that we could go to 400-kv but we should want special. . . . precautions in our insulation. . . . We had to reach a quick decision as to whether we could in fact take the risk to go to 400 kv, ... [and] whether we would be able to produce insulation when required. We took that risk, and we're satisfied that it was a reasonable risk.

Sykes: Does the CEGB now plan to change the whole existing 275 kv to 400 kv in time?

Casson: No.

Sykes: So you will retain three voltage levels, 132, 275, and 400-kv?

Casson: Yes, but we regard this decision to go to 400-kv as being a step from 132 kv to 400 kv, with the 275-kv being an intermediate step. . . . , which we had to adopt because we had, 10 years ago, to reinforce the system heavily and provide a new level of voltage at a time not long after the war when we had to do something quickly. But at that time 400 kv . . . had not been properly tried out. Therefore . . . we selected 275 kv as being. . . . the highest voltage that we could develop with certainty.

Sykes: Now it is obviously an excellent step at that time, to design the 275-kv towers to take a higher voltage from the insulation point of view. Will those towers carry the mechanical load of four-conductor bundle system at 400 kv?

Casson: No.

Sykes: So you won't be able to change over all the 275-kv system to the new 4-conductor system. . . .

Casson: No, but we shall have to restrict the use of the 275-kv level. . . . When we started to design the 275-kv system, we first introduced a light duty design. . . . which was *not* upratable [from the voltage or conductor point of view] and we have a considerable mileage of. . . . that type in commission. . . . You couldn't justify designing it for heavy duty 10 years ago.

Sykes: But can't the heavier construction towers sustain both the electrical uprating and the mechanical?

Casson: No, they cannot.

Describe Plans for 400-Kv Grid

Sykes: So you can't change existing 275-kv towers to use the four-conductor bundle 400-kv system?

Casson: No. We can only get about a 40% increase in power capacity by uprating to 400 kv.

Sykes: But using twin conductors only. So, some parts of the 275-kv system are suitable for conversion, not to your final standard of 4-conductor 400 kv, but only to twin conductor 400 kv, with a 40% increase in load carrying capacity?

Casson: You said 'final standard'. We must correct you there. We propose to introduce very heavy conductor lines, with four-bundle conductors, in special cases, but we're not intending to make it a standard line for the 400-kv system. In fact, we shall have three designs: . . . The 275-kv twin conductor 0.4-sq in (copper equivalent) which has been uprated, and which.... from an insulation point of view is not as good as lines. . . . specially designed for 400 kv. We shall have a new design of 400-kv twin 0.4 which has an improved lightning performance by decreasing the shielding angle, and also by extending the middle cross-arm—giving some protection against clashing of conductors under snow release conditions, apart from the improved clearances for insulation. Then we have the 'quad 0.4' which is for the special cases. . . . Once having introduced the special 400-kv twin conductor line, we shall not then use the 275-kv heavy duty line which we're using now.

Sykes: Will the towers, designed specifically for the new 400-kv quad lines, have the same general shape as the 275-kv towers?

Casson: Yes, in general the same lattice design.

Sykes: About 28 ft. higher?

Casson: Yes, [with] a single earth wire [on the apex] but with a decreased shielding angle, similar to the angle that they're using on the American Electric Power System, at 345-kv, of about 34 degrees.

Sykes: And twin earth wires into substations?

Casson: No.

Sykes: Will lightning performance of the 400 kv be better?

Casson: Well, from statistics. . . . taken of the overhead lines at high voltages throughout the world, it would appear that reducing the shielding angle from. . . . 45 degrees down to 34 should halve the lightning outages. And that, together with auto-reclosure, we feel would be satisfactory.

Sykes: Are you intending to use single-phase auto-reclosure?

Casson: No. Three-phase auto-reclosure on both the 400-kv and 275-kv systems.

Sykes: Approximately how much will the new 400-kv system cost per mile or per Mw of power transfer?

Casson: Well, for the heavy duty 275-kv line, ... something of the order of 23,000 £ ($64,400) a mile, I think. . . . The 400-kv quad line is going to be about double that.

Sykes: Double the cost—and the power transfer ratio?

Casson: Well, we have to be careful how we talk about power transfer, because it depends on the length and the thermal rating. . . . In round figures, ... the quad lines will be at least 1,500 Mw per circuit. The twin 0.4— . . . . the old construction or the new—will be of the order of 900 Mw. Of course, all our routes use double circuit lines.

Sykes: What particular steps in regard to insulation, have been taken to counter the polluted atmosphere in Britain? Is it a question of deepening the sheds of insulators, putting more petticoats on them, or simply using more units of the standard type, or what?

Casson: We have two problems, one is the conversion of the existing lines in which we have restricted clearance length to get our insulation in. Here we are not actually increasing the length of insulators, but we are increasing the diameter, and giving a creepage distance of about 1.25 in. per kv.

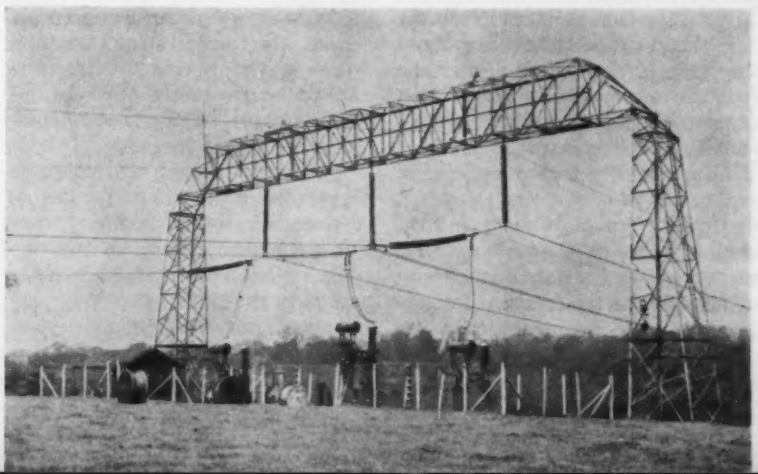
D. G. Cherry: We have a preliminary design for the prototype line, and obviously if you make the insulator disc wider, you can to some extent make it deeper, but not much. If you said the same general form as before, but bigger, you've got the right answer.

Casson: I think . . . the new lines will be the same standard insulators as we use now. We shall just increase the number . . . of insulator discs up to about 24 from 18, as we use for the 275-kv lines.

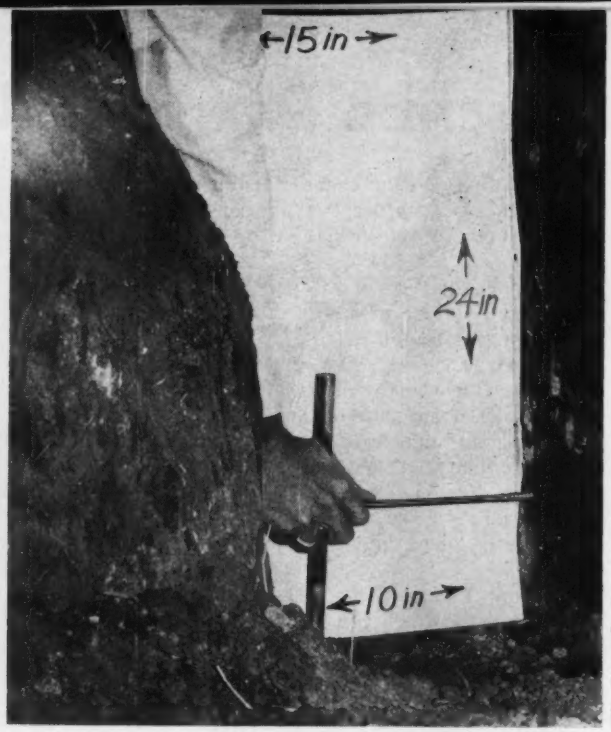
Sykes: What about radio and tele-

(*Continued on page* 51)

EXPERIMENTAL 400-KV LINE of Leatherhead is used in design of CEGB's grid



STANDARD-SIZE EXCAVATION for treatment of pole permits boring to 6-in. depth



EXCAVATION is enlarged to allow boring at 18-in. depth in pole in dry, sandy soil where decay is deeper

Facts Developed by Experts Are

Field and laboratory data on wood preservative retention and toxicity must support economical treatment timing

PHILIP M. OPSAL, Assistant Professor,
HARRY E. TROXELL, Associate Professor,
Wood Utilization Laboratory, Colorado State University, Ft. Collins, Colo.

An effective utility company pole maintenance program needs precise determination of the retention and toxicity of the preservative remaining in the wood of standing poles. Trained personnel should develop the factual data both in the field and in the laboratory from sampling of the poles. From the findings, a timetable for the most economical supplemental treatment should be developed.

Groundline treatment of poles, carried out without such a timetable, can cost a utility company a good deal of money. Unless the treatment schedule is in accordance with a factual timetable, the company may be spending money on poles holding enough effective preservative to keep them in use another 10-20 years.

But a program designed to keep under observation the very slow decline in preservative retention and toxicity prepares a utility for taking the proper timely action when these attributes fall below minimum allowable levels. Scientific identification of organisms causing wood decay give a company knowledge useful both in ordering poles and in setting up preservative retention specifications, especially with reference to the new preservatives known to be highly toxic to particular wood-destroying fungi.

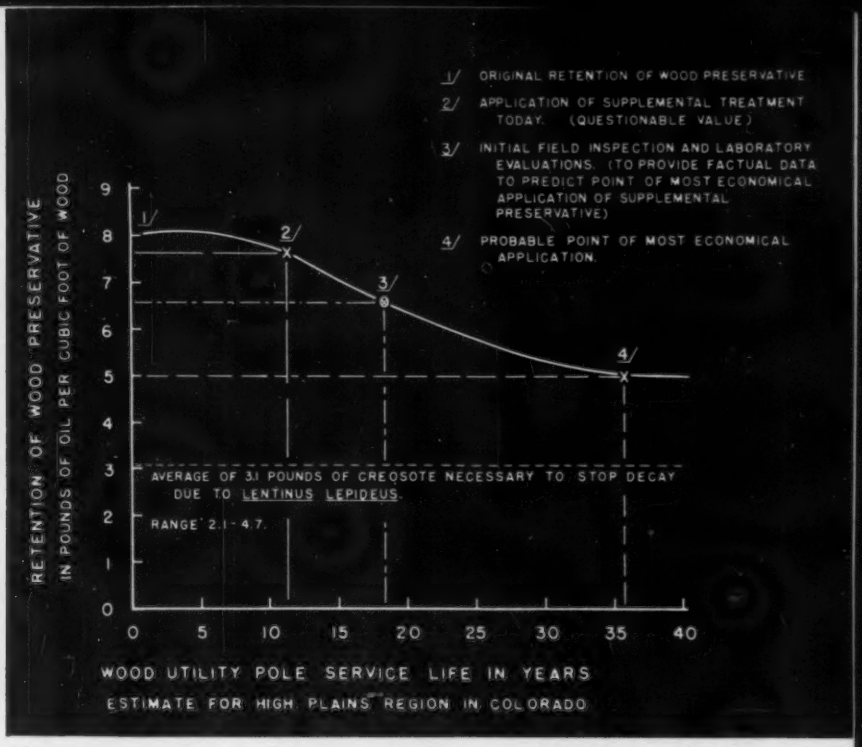
The experience of a neighboring company is no substitute for factual investigation. One company may find premature failures in a group of poles from one producer for a certain year; another company may continue using poles from the same lot without trouble. Accordingly, when they met last year at wood pole conferences across the country, company managers were unanimous on the importance of systematic field inspection, statistical control, and laboratory study in a pole-maintenance program. A controlled wood-pole maintenance program, it was pointed out, results in extremely low pole mortality and higher continuity of poles in service.

Small Samples Serve

With an accurate picture of the conditioning of the poles in an area, a company can decide what should be done to prolong their useful life in the system. Often no immediate action is indicated, as the field results may reveal only a very small incidence of decay, and the laboratory evaluations often show higher-than-minimum preservative retention and high toxicity to the decay fungi in the area.

A small, but properly selected inspection sample tells the condition

LABORATORY EVALUATION gauges remaining preservative and toxicity


1/ ORIGINAL RETENTION OF WOOD PRESERVATIVE
2/ APPLICATION OF SUPPLEMENTAL TREATMENT TODAY. (QUESTIONABLE VALUE)
3/ INITIAL FIELD INSPECTION AND LABORATORY EVALUATIONS. (TO PROVIDE FACTUAL DATA TO PREDICT POINT OF MOST ECONOMICAL APPLICATION OF SUPPLEMENTAL PRESERVATIVE)
4/ PROBABLE POINT OF MOST ECONOMICAL APPLICATION.
RETENTION OF WOOD PRESERVATIVE IN POUNDS OF OIL PER CUBIC FOOT OF WOOD
AVERAGE OF 3.1 POUNDS OF CREOSOTE NECESSARY TO STOP DECAY DUE TO LENTINUS LEPIDEUS.
RANGE 2.1 - 4.7.
WOOD UTILITY POLE SERVICE LIFE IN YEARS
ESTIMATE FOR HIGH PLAINS REGION IN COLORADO

GRAPH, using factual data, becomes a utility company tool. Field and laboratory data are combined to make a timetable for economic retreatment of poles

Prime Need in Pole Maintenance

of the poles in an area. It is never desirable, certainly not practical, to inspect all poles initially. The Edison Electric Institute and the Rural Electrification Administration prescribe inspection samples of about 10% of the poles in an area. The manner of their selection, however, is extremely important: It is not a matter of taking every fourth, fifth, or sixth pole, or a mile of poles here and there.

In the proper method, each pole in a section of a system is listed, such a listing amounting to an inventory. The data include the kind and year of preservative treatment, pole species and producer, the type and moisture condition of the soil, and the ultimate use. Then from poles manufactured by a particular producer in a particular year, a 10% sample is taken. This is done for each group of poles from all producers for each year. All steps are important and must be followed in the prescribed order, and the sampling must be done by qualified people.

A study of sampling at Colorado State University concluded that a 10% sample, properly selected, can show a true picture of pole condition in even a large area. In this study, a sample of 379 poles was inspected in the field before a 100% inspection and groundline treatment of a 225-mile area containing about 3,800 poles. Results obtained with the sample approximated those obtained by total inspection, the poles studied being lodgepole pine full-length pressure-treated with creosote. They had been set eight years before the inspection. Results are summarized below:

Poles Inspected	Poles with Decay	Decay Incidence
3,745 (100%)	51	1.36%
379 (10%)	7	1.85%

Another of the university's studies, made in an area containing 1,400 in-service poles, showed these poles to be in excellent condition after nine years' service. In this study, 100 poles (7%) were inspected carefully.

Increment boring revealed excellent preservative penetration and well treated checks which had been opened before treatment by proper air seasoning. Many poles had preservative filling the pith cylinder. Laboratory assay showed more than enough preservative remaining to guard the wood against deterioration.

Sampling, laboratory evaluations, and the employment of qualified personnel are endorsed in a paper entitled "Utility Pole Controls," by F. P. Tierney and G. H. Lund, Northern States Power Co. On the personnel requirement, these authors declare:

"A graduate wood technologist not only comes to you with the training required to handle the chemistry involved, but also with a basic knowledge of wood structure and forest pathology. This training is of great importance in the inspection field alone. . . .

"It has been our experience that

line crews are unable to reliably judge the soundness of wood poles. They frequently confuse decay with natural variations in wood density and moisture content. A common statement used is that the wood is 'punky.' Such errors are very serious in the case of field inspection of standing poles where replacement costs are high. Costs of $100 to $150 are common with some approaching the $400 level."

This inability of inexpert personnel to distinguish variations of natural wood properties from wood deterioration eventually proves costly.

Can Vary Sample

Only an expert knows how to vary the sampling procedure for conditions in different localities. A pole in clay soil in a river-bottom or lowland stretch, which is constantly wet, must be viewed differently than one in dry sandy soil on the plains of eastern Colorado. In the latter case, it is not uncommon to find decay below the standard 18-in. inspection depth, and down almost to the butt, some 4 to 5 ft below the groundline. Such decay is discoverable only by inspection below 20 in. Such inspection generally should follow these steps:

1. The pole above ground, including the hardware, should be inspected.

2. Excavation should proceed to the 20-in. depth or deeper as circumstances dictate.

3. Sounding with a hammer should be made on all sides of the pole above and below groundline to find large decay pockets quickly.

4. Three borings should be made at 4, 14, and 18 in. below the groundline and 120 deg apart on the circumference, and with an increment borer. Holes should be plugged with preservative-treated wooden plugs.

5. All borings should be retained for laboratory assay.

6. Preservative protection added to sample poles should be followed by backfilling and tamping.

7. All data should be carefully recorded and include brand information and notations of loose hardware.

An increment borer tells a trained inspector the condition of the pole's interior. Its borings reveal preservative penetration, provide for estimation of retention, and facilitate observation of checks and pith chamber for determining whether the preservative has penetrated them. This latter information indicates the seasoning of the pole before original treatment.

In research at CSU, as many as nine borings, not more than three in any horizontal plane, were made in small poles without failure even with heavy or excess loading due to ice and wind. A 0.2-in.-dia borer, with a 9-in.-long bit, gives more wood and provides more preservative for assay.

Borings made in the field go to the laboratory for evaluation. The first evaluation determines the amount of original wood preservative remaining. The assay method is in accordance with Wood-Preservers' Association specifications. The second evaluation actually tests the preservative's toxicity to a wood-decay fungus and is carried out in accordance with American Society of Testing Materials designation D1413-56T.

Without combining the results of field inspection and laboratory assay, no really sound decisions can be made regarding maintenance programing. And the economics of such a program appear in the following hypothetical instance.

How Money Is Saved

An area having 4,000 poles, about ten years old, is found to have 15 poles stubbed or removed, and ten poles inspected originally show a need for inspection again in three to five years because of slight deterioration. Here the rate of deterioration is well below the 1% for ten years' service shown in pole mortality tables. The utility paid $4 per pole, or some $16,000 for groundline treatment. The question therefore is how many poles were treated which would not need treatment for another ten years? And how much interest would the money spent earn in that period?

Estimating that 60% of the poles did not need treatment, the money spent unnecessarily comes to $9,600. In a ten-year period, at 4%, this sum would have earned $4,600. This hypothetical case suggests the urgency of a good maintenance program.

Groundline treatment was intended originally for poles having a naturally durable heartwood and a relatively thin and easily penetrable sapwood. The original intention was to replenish the wood preservative in the sapwood layer by means of the supplemental treatment. The scope of this intention widened in recent years for several reasons.

Just before World War II and until 1954, the demand for wood poles was tremendous. Utility companies accepted almost any pole in order to complete construction on schedule. Such pressure led some producers to ship poles which would not ordinarily have left the plant until they were properly seasoned and treated.

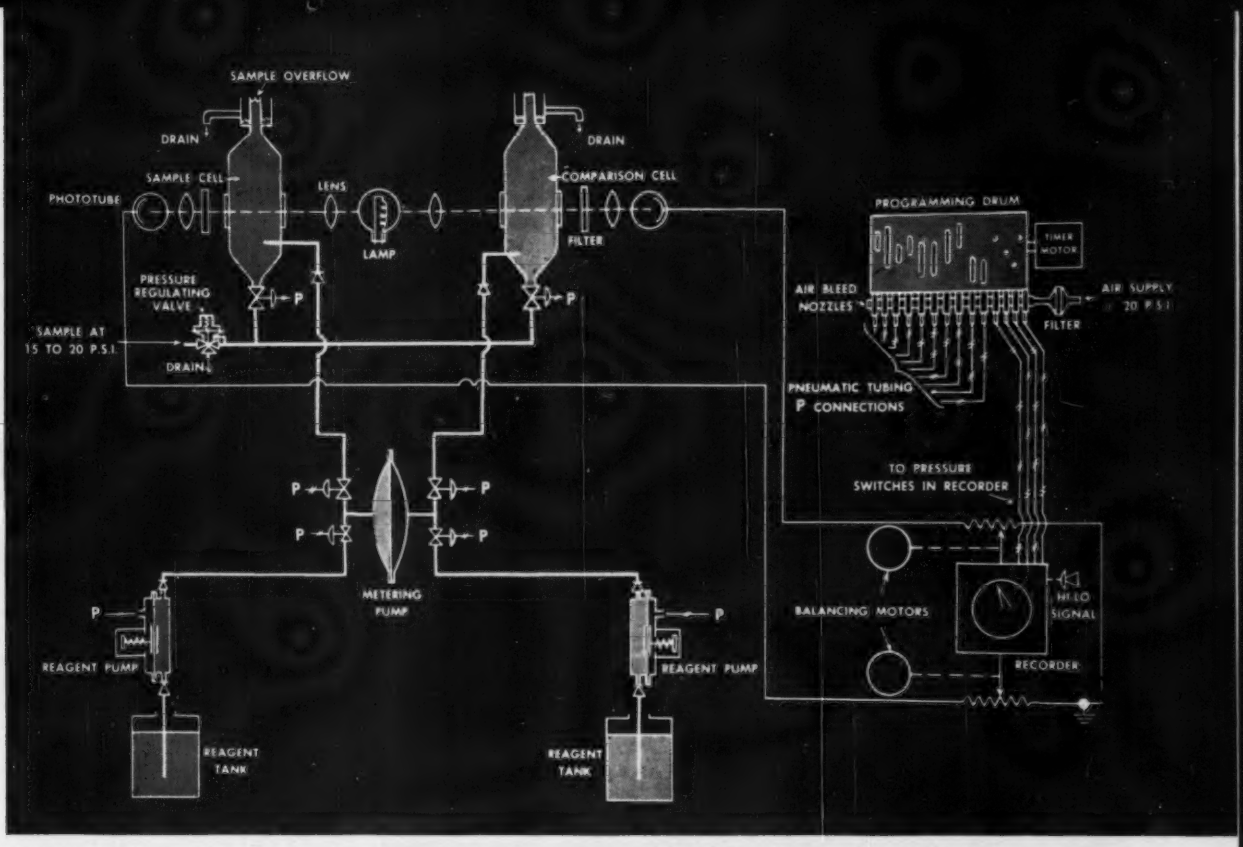
Mixture Important

Filling the demand, some producers couldn't let poles season properly before treatment, and certain specifications tolerated treatment of green poles. As a result in the Rocky Mountain region decay pockets associated with checks due to improper seasoning is the major cause of early pole failure.

But some premature pole failures are attributable to inferior preservatives. Producers during the high-demand period were allowed to use certain mixtures of preservatives with oil, the oil having no preservative value and was not used in conformity with American Wood-Preservers' Association specifications. Some of these mixtures did not impart the protection for guarding the wood against decay and other deteriorating agencies.

Identification of the wood-decay fungus, Lentinus lepideus in 80% of the cases observed by the author is of interest due to the fact that this fungus is highly tolerant to creosote and grows in considerably higher concentrations of creosote than other wood-decay fungi.

Inadequate seasoning, substandard preservatives, and poor inspection at the treating plant, accordingly, seem to be the main causes of utility company troubles. This is not the case, however, with all poles of this generation. In fact, a penny for every pole properly seasoned, treated, and inspected would amount to a sizable sum. Personal experience in the inspection of thousands of poles leads the author to hold that many poles of this doubtful period (1946-54) do not need a supplemental treatment today.



SCHEMATIC shows colorimetric analyzer in its simplest form, as it is used for boiler water determination. In silica analysis, as at Philadelphia Electric Co's Schuylkill Plant, it operates on a 12-min cycle producing chart like that on page 49

Silica Control Made Automatic

Colorimetric analyzer, by keeping boiler and turbine surfaces clean, maintains Schuylkill Station efficiency

Fully automatic colorimetric analysis today is affording the kind of water treatment required to keep boiler and turbine surfaces clean, and so maintain efficiency levels designed into modern high-pressure steam plants. Such a unit in the Schuylkill Station water treatment system is giving Philadelphia Electric Co better control of silica, a continuous record, and a means of checking to locate an exchanger nearing the end of its run.

Virtually a self-contained colorimetric laboratory, this sensitive instrumentation monitors contamination in the parts-per-billion range on a 'round-the-clock basis. It is much more rapid than conventional volumetric and gravimetric analyses.

Power-plant engineers, in perfecting single boiler-turbine operation at higher pressures and temperatures, set up the requirements for the needed water treatment equipment. The treatment had to keep pace with power-plant advances from the usual 250-psi operation of not very long ago to today's 2,700-psi operation. Even operation at 5,000 psi has been attained.

Gains Bring Problems

When power plants reached these higher pressures and temperatures, engineers found a myriad of new problems and old problems with new severities. Maintaining clean boiler and turbine surfaces was among the most troublesome.

Though not new, colorimetry had been a laboratory tool. Early instruments were designed for residual hardness determinations in water that had been through the Zeolite softening process. But newer designs were brought out for the determination of dissolved silica, phosphate, free chlorine, hydrazine, iron, and copper. These were followed by instruments for controlling gas absorption. Design goals were established which later led to complete automatic programing and elimination of all semblance of laboratory glassware.

The Quantichem analyzer used at Schuylkill Station is one of the more sophisticated colorimetric devices available. It consists of two units—an analyzer and a recorder. The analyzer has the light source, light filters, sample cells, sample and reagent metering pumps, photocells, and a timing programer. Self-monitoring, it flashes a warning light when the sample cells need cleaning or a light source fails. The recorder unit has a standard bridge potentiometer modified for special requirements, and single and multiple point recorders can be used.

The analyzer's timer programer is

pneumatic and works on the player piano principle: The program is code-pierced into the wall of a revolving drum. At timed steps, slits in the drum release air under pressure into appropriate lines which actuate electrical switches, diaphragm values, or reagent pumps.

Standardizes Self

In a typical determination, the analyzer flushes and drains the sample cells and fills them with metered samples of demineralizer or softener effluent. The instrument standardizes itself. When it cannot standardize, the cell windows may need cleaning, a condition signalized by a warning light. This happens rarely, most determinations not tending to obscure the windows.

Once standardized, the analyzer meters reagents into the cells. It measures the difference between light transmitted from the sample cell and that from the blank cell. The signal is recorded on a chart in terms of concentration. When the cells are drained, the cycle is repeated. In silica analysis, the analyzer operates on a 12-min cycle. Other cycles are as short as 6 min.

In silica determination, the analyzer measures a buffer into the sample cells to maintain pH close to 1.7. Then it meters in ammonium molybdate which, at the low pH, polymerizes to a complex. This complex reacts with silicon and phosphorus to form heteropolymolybdic acids. The instrument then meters in a reagent to decompose the phosphomolybdic acid without affecting the silicomolybdic acid.

The fourth and final reagent forms colloidal molybdenum blue with the silicomolybdic acid, and the photoelectric cells measure the light transmitted by this blue liquid. Simultaneously, the reagents react in a mixing cell and pass to the blank cell. The only color in the blank or zero cell is that of the reagents themselves.

The standard range of the analyzer in silica analysis is zero to 50 ppb and accurately detects changes because it is specific for the constituents analyzed. Specifications for ruggedness and low maintenance explain other features not bearing on analysis. The two-unit construction proves that a sensitive instrument need not be delicate and immobile. Although the analysis and recording components are mounted together, they can be used as far as 100 ft apart.

Modifications Made

As flow through a power plant doubles, so also does the damage from contamination. But damage may more than double when silica is permitted to coat turbine blades. Formerly, contamination measured in ppm could be tolerated without extraordinary damage and expense. But today power-plant engineers must confine contamination to the ppb range, making corrections as rapidly as a process error occurs.

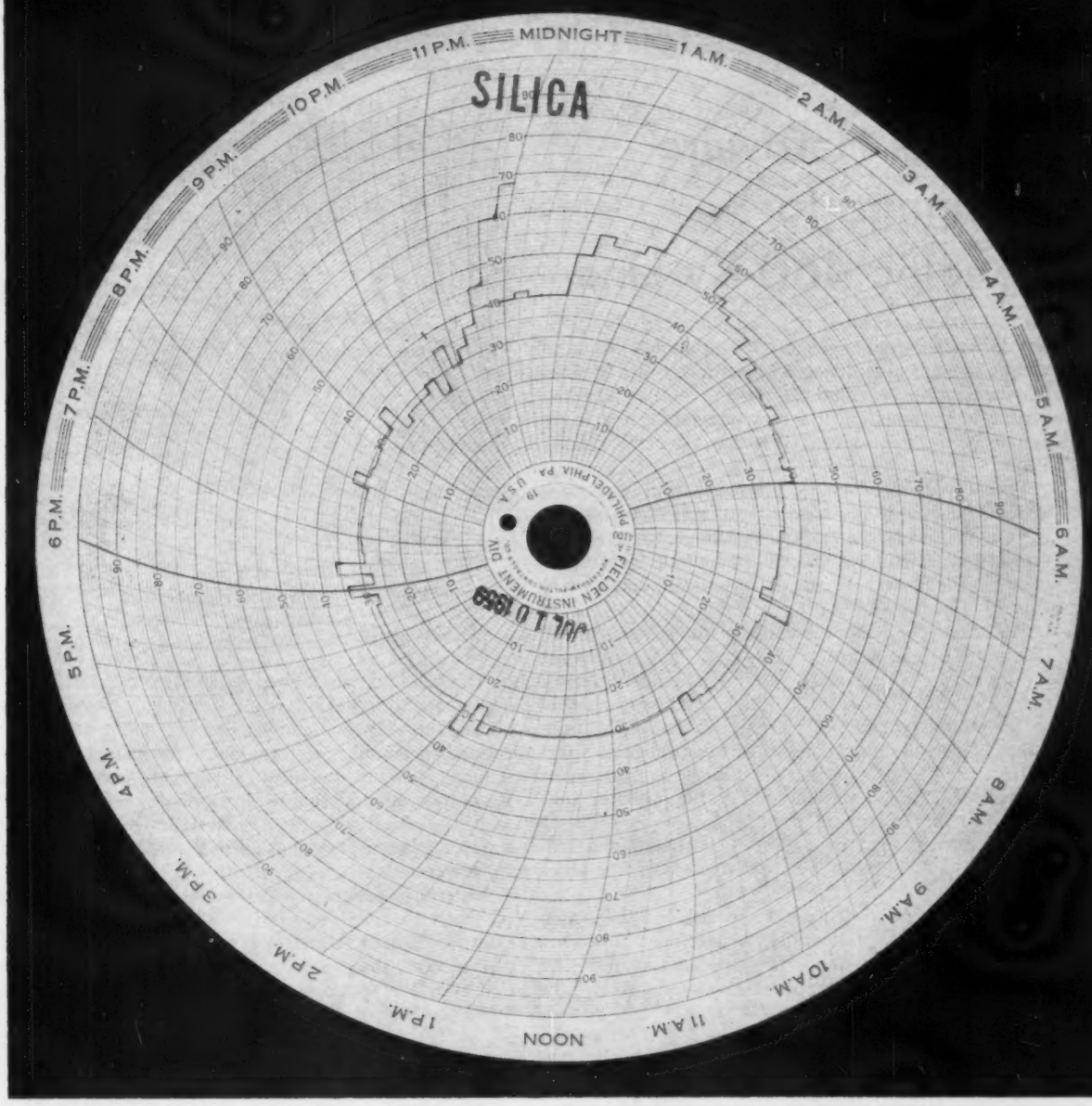
Thus, when contamination became a problem Philadelphia Electric engineers and chemists worked closely with Milton Roy Co in the development of the present model of the Quantichem analyzer used. For longer than 18 months, an experimental model operated at PEC's Schuylkill plant. Experience with it produced data for modifications which have since been incorporated in today's unit.

For example, PEC engineers suggested that the heavy brass in the "piano roll" type programer was too heavy a load on the motor. This component is now aluminum. PEC engineers suggested an option in the way reagent is fed to the cells, as they would often use the analyzer as a portable unit for trouble-shooting.

Maintenance has not been a problem, although at Schuylkill one day a month has been allowed for it. But experience with the production model seems to indicate that so much time is not needed. The new analyzer at the station is used today as a constant monitor for silica on the total effluent from five anion and five cation exchangers.

Before the analyzer was installed, Schuylkill plant engineers checked for high silica and silica breakthrough about once per shift on

COLORIMETRIC ANALYZER at Schuylkill Station in Philadelphia is used to monitor the boiler water on a 'round-the-clock basis. The instrument is fully automatic



AUTOMATIC ALARM signals silica breakthrough at 2:25 am July 10, 1960, at Schuylkill Station, enabling operations to be brought back under control immediately. Critical situations are recorded on continuous chart as they develop

each exchanger. There was practically no immediate protection against silica breakthrough in the 80,000 lb per hr system. A tripout on the total effluent was controlled by changes in conductivity, which is only appreciably affected by a large amount of silica. Silica concentration must run 0.5 to 1.0 ppm to effect a considerable change. Such concentrations would necessitate the dumping of a 1-million gal tank to the sewer.

Now, in a 12-min reading, the analyzer measures silica in total effluent. When silica of 0.04 to 0.05 ppm is spotted, the analyzer alerts a technician by alarm. The latter takes pH and conductivity readings to spot the causative demineralizer. The analyzer rapidly checks each demineralizer to pinpoint the breakthrough.

Faster, More Accurate

Speed is not the unit's only advantage; it is also more accurate than former techniques. Conventional laboratory techniques have not been accurate below 0.03 ppm. The analyzer performed well at 0.01 ppm and lower.

Use of the experimental and the production units at Schuylkill gave PEC these advantages:

1. Decided improvement in control of silica

2. A continuous record

3. A means of checking water treatment equipment and pinpointing an exchanger nearing the end of its run.

In a future project, PEC will hook a tripout device to the analyzer.

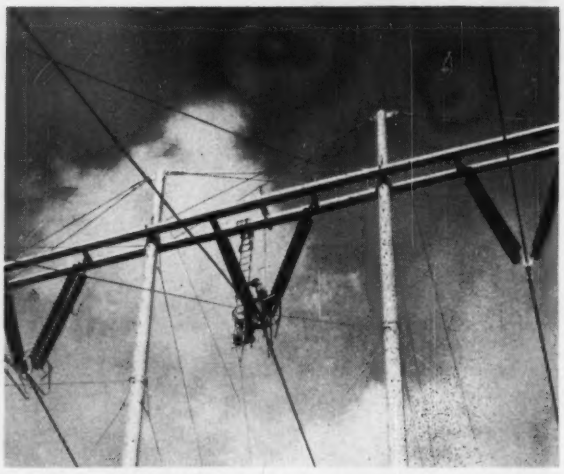
Special Hardware Designed for Penelec 460-Kv Line

Four-string, double-yoked "V" insulator assemblies, unique in transmission construction today, are included in two sections (A and D) of the 460-kv, 13-mile prototype transmission line now undergoing test in the system of the Pennsylvania Electric Co near Altoona, Penn.

Specially designed yokes, produced from basic components adapted to the special requirements dictated by the unique towers, the extra high voltage, the extremely rugged terrain and the special conductors, were developed by The Brewer-Titchener Corp in conjunction with General Electric Co.

All three conductor assemblies on Tower No. 90 (Section D) consist of a dead-end "V" suspension arrangement. Conductors are dead-ended to the special cruciform yoke plate which is in turn attached to the double-yoked "V" strings of 26 10-in. insulators. This yoke plate consists of two triangular yokes at right angles, arranged as shown in the accompanying drawing. Maximum vertical load on the insulator yoke is 56,400 lb. Maximum horizontal load is 4,380 lb with a vertical load of 14,490 lb. Maximum longitudinal load is 4,700 lb with a vertical load that totals 43,480 lb.

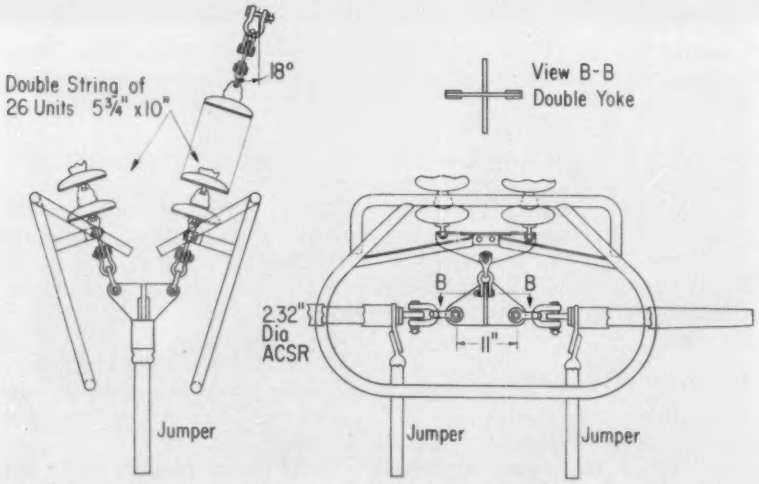
Six assemblies on Towers No. 6 and No. 7 (Section A) consist of a "V" suspension arrangement. The twin conductors held in standard suspension clamps are attached to a special trapezoidal plate and in turn attached to the double-yoked "V" strings.



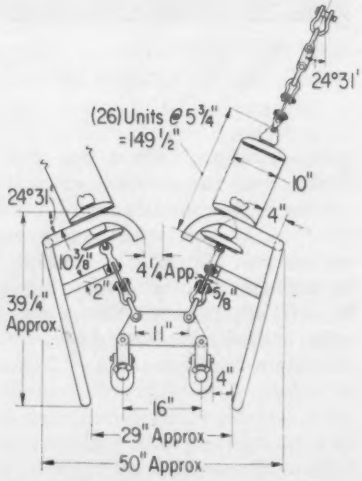
DOUBLE YOKED V-STRING insulator sets attached to special yoke plate to which 2.32-in. conductor is dead-ended

The insulator assemblies are capable of carrying exceptionally heavy load while hot-line maintenance is carried on safely and easily. The "V" string suspension insulator assemblies restrain lateral movement and consequently reduce the over-all size of the supporting structures. In addition to supporting the tremendous weight of the conductor, the new designs will permit reduced phase spacing as well as reduce the cost of the towers.

Especially designed yokes were used on two towers of the 4.14 mile section (A) that has twin 1.75-in. expanded ACSR conductor spaced 16 in. They are also used on the one tower of the 1.9-mile section (D) that uses the specially-designed single-conductor that has a 2.32 in. diameter.



CRUCIFORM YOKE made of two triangular yokes at right angles holds conductor in tension-suspension arrangement from V strings



TRAPEZODIAL YOKE and V insulator strings support twin conductors

vision interference? Have special steps been taken to reduce them?

Casson: On lines which will be uprated, . . . no other steps . . . than the change of insulators.

Cherry: Could we make it clear that the CEGB has no serious television interference on the existing 275-kv lines?

Casson: And we're not anticipating any trouble when they are uprated to 400-kv, but we have obviously got to do some tests. And that's one of the objects of the experimental installation, the conversion of the first line from 275 kv to 400 kv, that is in progress now.

Cherry: Continuous recording installation is being put under the experimental line . . . We have been running an experimental line at 380-kv at Leatherhead for radio interference tests for some years. With the new quad conductor system, the stress is lower, and therefore it is very unlikely that radio interference would be worse.

Sykes: What about corona loss?

Casson: Don't forget corona loss measurements have been carried on at the same time, and we don't anticipate any sort of trouble.

Sykes: It won't be critical?

Casson: No. Not with us. You see, the average length of line will be about 80 miles; the longest 150.

Sykes: Now turning to the terminations of the 400-kv line, Mr. Casson, what size of transformer do you anticipate using?

Casson: Well, there are two types of transformers that we envisage using. First, 400-kv to 275-kv auto-transformers. We haven't yet decided whether we'll have tap-changers or not, or some other form of voltage control. Then there'll be 400-kv to 132-kv units, . . . also auto-transformers, and both will have tertiary windings.

Sykes: For reactance control?

Casson: It has a double purpose . . . , for harmonic control . . . and also for connecting synchronous condensers, or other forms of compensation.

Sykes: So what sort of sizes do you expect to go up to?

Casson: Well, . . . for the auto-transformers we might possibly go to about 350 Mva . . .

Cherry: Or even 500 Mva, 3-phase.

Casson: . . . That's the limit for transport [facilities] from the works, but . . . we're looking into also the possibility of constructing transformers on site. That . . . obviously would pay if we could get a proper technique. . . . But there are no immediate developments . . . We are also perhaps considering 400-kv to 66-kv double winding or triple winding units . . . . of the order of 240 Mva.

Sykes: Now, while the existing 275-kv equipment was designed for uprating, what about clearances for the substation switching equipment? Will you always step the voltage down at the substations? Or do you envisage 400-kv substations?

Casson: I think we could say in general that we don't anticipate having 400, 275, and 132 kv at the same point.

Sykes: But you may have new 400-kv substations?

Casson: Where possible. We'll have 400-kv to 132-kv, in which we'll probably have a 400-kv switching station, and then we'll have 275-kv to 132-kv, and elsewhere 400-kv to 275-kv.

Sykes: Will you attempt to change existing 275-kv subs to 400-kv?

Casson: If possible, yes. . . . Incidentally we're looking into the designs of 275-kv and even 400-kv indoor substations.

Cherry: One of the motives in getting moving on this new voltage level possibly a little earlier than you expected, is because we have to build in sufficient reserve capacity to enable enough system to be left to enable those changeovers to be made. It's no good waiting . . . until you haven't got enough system to take the power, while you're changing over.

Casson: Yes, well we have an advantage in this country . . . in looking ahead at our requirements, and being able to make a decision change the system in the whole of the country, if necessary, and not just a particular part of it. . . .

Sykes: Allowing for the doubling of demand in 10 years—or less if some of the trends today continue—in 10 or 15 years' time, can you put more power through your 400-kv lines?

Cherry: Yes.

Casson: We think that this uprating, the adoption of this higher level of 400-kv will meet the needs from now for over 15 years.

Cherry: At the present rate of expansion.

Casson: And probably more . . . But I will say that the Board are looking ahead, they're not going to just leave it at 400-kv. . . . They've now got some time . . . to consider a higher voltage if necessary. And research work is being carried on looking at voltages up to say about 750-kv. They are putting in equipment at their laboratories to do it.

Sykes: So with this 400-kv system the British grid will be pretty well into the forefront of power transmission systems in the world, apart from the Russians who have said they are going up to 500 kv, for special reasons.

Casson: . . . We did consider as an alternative the 500-kv level. . . . In looking ahead, both into uprating to 400 kv and 500 kv, and thinking of the time at which we could introduce these voltages, we realized that we could not introduce 500-kv until a few years later than 400-kv. And we found also that there was no difference in the cost of the two schemes and that 400-kv in general had advantages from amenities point of view, because strange though it may seem, it resulted in less mileage of new lines than a change to 500-kv would have done. I believe it to be true that in Britain we shift more power per route than . . . in any other country.

ELECTRIC UTILITY METHODS

Eum

CONSTRUCTION

Custom Towers Solve Right-of-Way Problem

DEAN MILLER, Transmission Engineer, Electrical Engineering Div, Engineering Dept, Electrical Div, Public Service Co of Colorado

Narrow-based lattice-type steel poles with offset ally-arms cantilevered from the mast recently met the restrictions of a narrow right-of-way through a heavily industrialized section of Denver. Designed by American Bridge Div, US Steel Corp, for a 115-kv tie line of Public Service Co of Colo. The achieved tower type was built and erected through railroad yards, along the Platte River bank, over viaducts and along a portion of the interstate highway system where right-of-way restrictions precluded the conventional approach.

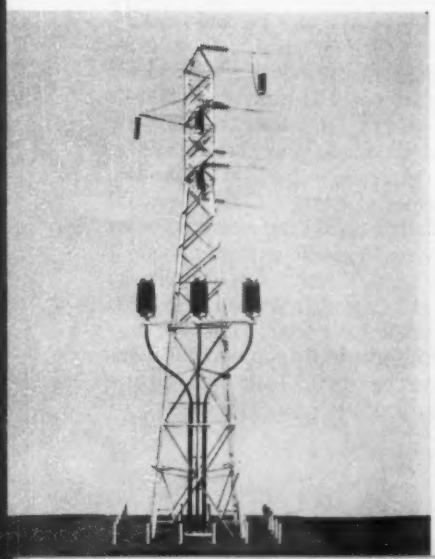
These unique poles vary in height from 50 to 80 ft, bottom crossarm to ground line; and they are 3-ft square at the base, tapering to an 8-in. square top. Set approximately 9 ft in the ground, they are held in position by 6 cu yd of concrete. Sectional ground rods were driven prior to pouring of the concrete and the bases were grounded by means of No. 4 solid copper wire to one of the bolted connections. Designed for heavy loading conditions on 715,000 CM all-aluminum conductor, they are capable of withstanding a 300-lb transverse load at the pole top.

In instances on corners where guying was not possible due to the limited 55-ft right-of-way width, wide-based towers with the same crossarm configuration were used. Varying in height from 50 to 90 ft to the bottom arm, the wide-base structure footings are made up of stub angles set in concrete. In a few cases where small angles were involved and right-of-way space allowed, it was more practical and economical to use the narrow-base poles plus a conventional side guy than to use wide-based towers.

Where a distribution underbuild was necessary, steel arms and pins were furnished. Span lengths were reduced from an average of 350 ft to 270 ft for the convenience of the distribution dept, but there are several 600-ft spans for river and highway crossings.

A very low final tension was designed, 10% at 60 F, and a minimum of 40-ft ground clearance.

A total of 107 towers were installed in two sections of line for a total of 6.17 miles between the Denver Terminal and Cherokee Steam Plant north of Denver.



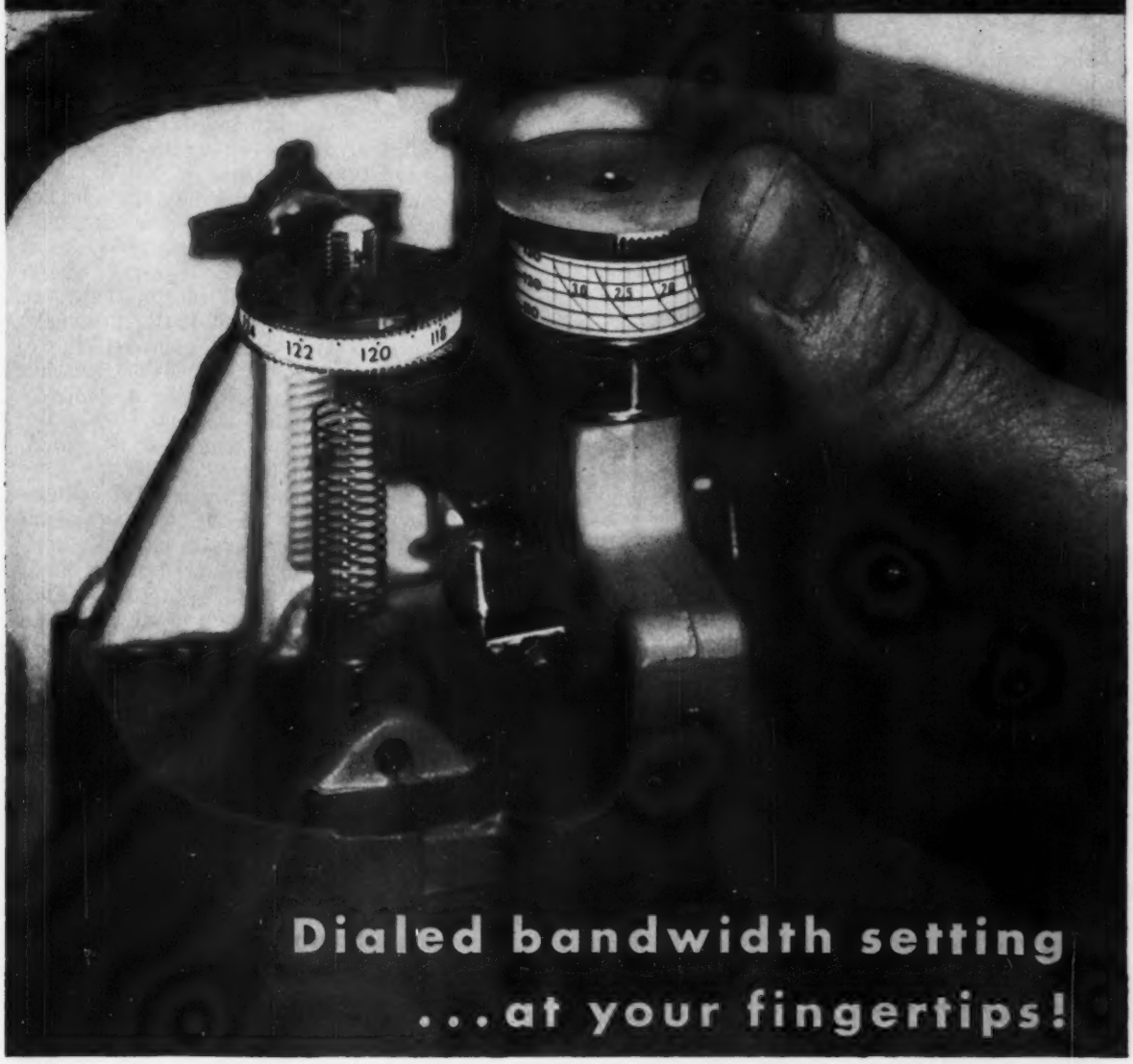
Modify Tower for 120-Kv Potheads

JOHN S. WENGER, Trans Engr, General Engineering Dept, Detroit Edison Co, Detroit, Mich.

A structure incorporating a 120-kv cable termination into a conventional strain tower has been developed by Detroit Edison Co. It is intended that this termination will be used in those cases where its use will eliminate the need for a separate terminal site.

This structure consists of a standard 86-ft strain tower with minor modifications to take a cable pothead installation. These modifications include the addition of a platform 34 ft above the ground level and two arms to provide clearance for risers to the middle and top phase conductors. Arresters of the short variety are installed directly on the crossarms. A second pothead installation can be made on the opposite side of the structure in a similar manner.

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



Dialed bandwidth setting ...at your fingertips!

New, exclusive G-E Micro-Band* relay permits fast, accurate setting of both regulator voltage level and bandwidth

Now, with General Electric single- and three-phase step voltage regulators, you can dial optimum voltage level *and* bandwidth *in seconds . . . with micrometer accuracy!*

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Micro-Band relay saves you time and money by eliminating the guesswork and painstaking procedures normally involved in making regulator adjustments. What's more, this *full* calibration permits precise coordination of voltage level and bandwidth setting with General Electric's highly flexible time-delay control. Thus, you take full advantage of the reduced bandwidths possible with General Electric regulators—bandwidths proven by recent computer studies to offer you increased system earnings at no sacrifice of regulator life.

Your General Electric regulator representative has complete information on the new Micro-Band relay and can show you how to achieve system savings through reduced regulator bandwidths. Call him today. Or write General Electric Company, Section 456-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

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Progress Is Our Most Important Product

GENERAL ELECTRIC

Doble Cites Need for Oil Tests

Tells Boston conference electrical industry must aid refiners by developing specifications for insulating oils

The electrical industry needs tests to aid refiners in the production of good insulating oils, F. C. Doble told the Doble Engineering Co's 28th client conference recently in Boston, Mass.

A meaningful specification for oils having a conventional flash point has still to be written, and the situation is even more perplexing with regard to high flash point oil for distribution transformers, he said. Such oil, he noted, should serve for long periods without much maintenance, such service usually accelerating the sludging of aromatics. On the other hand, power transformers get regular maintenance and benefit from aromatics in the oil, Doble continued. But oil in switchgear, used for its arc-quenching ability, could be improved by eliminating the aromatics.

Doble noted that a multiplicity of tests (28, according to refinery delegates) has been devised by equipment manufacturers for controlling the quality of insulating oil. Those duplicating results, he said, should be abandoned. The objective, he said, should be quality rather than economy, as oil represents only 2% of the cost of an EHV transformer.

Potential Take-off Speeds Settings

New portable reference-potential equipment enabled Public Service Co of Indiana to adjust relays and instruments quickly and economically for correct operation when applied to the bushings and coupling capcitors of several 230-kv substations, reported A. H. Arbuckle. The new devices improved the settings of 84 potential devices in ten working days without the cost and inconvenience of setting up 230-kv potential transformers at each test site.

These operate from a connection to the capacitance tap of a bushing in service on a high-voltage system, said E. H. Povey of Doble Engineering. Connected to a bushing of known capacitance and power factor, the set derives a low working voltage, say 100 v, at known phase and ratio relationship to the line voltage with an accuracy comparable to that of a Class A potential transformer, he said.

Test instruments, he continued, compare the established reference voltage with the output of conventional potential devices and allow rapid evaluation and adjustment of settings. Phase relationship of reference to line voltage is determined from the power factor of the bushing connected to the set, and the voltage ratio is determined from the bushing's C_1 capacitance.

Povey pointed out that a feedback-controlled amplifier makes the set's output independent of load. Furthermore, the instrument can be placed near the potential device being adjusted, so that adjustment steps can be evaluated easily. Errors less than 0.2% ratio and 10 min of phase angle compare favorably with those of a Class A potential transformer, he concluded.

Doble's A. L. Rickley and R. E. Clark reported that field experience in adjusting almost 200 bushing and capacitor potential devices with the new instrument proved that bushing potential devices without a potential transformer are set with an accuracy the same as that obtained with a transformer, potential devices are adjusted in any position more rapidly with or without a potential transformer, and settings are consistently more accurate, allowing more critical relay adjustment.

Coupling Capacitors Show Low PF

Modern coupling capacitors without surface leakage should test under 0.5% pf, said Rickley and G. W. Armstrong Jr, the latter also of Doble. Higher values, they said, indicate contamination or deterioration, and significant increases in capacitance over nameplate or earlier test data denote section failure.

Oil circuit reclosers may be left in service at 14.4 kv for three years without maintenance, suggested R. A. Bailey, Knoxville Utilities Board. Although insulation failures are rare, insulating elements should be replaced or dried out when tests show insulation losses above 0.20 w at 10 kv on a closed or open breaker, he said.

Corona occurs at 13.2 kv in any insulation system in which dielectric stress exceeds the value causing ionization of the insulation, according to A. M. MacDonald, J. D. Alexander, and R. K. Brown, all of Indianapolis Power & Light Co. They noted that electrons detached in the process erode the adjacent surface, and air acts to ionize and form ozone and nitric and nitrous acid, all highly corrosive.

In many types of indoor and outdoor switchgear, corona occurs across air gaps in insulation composed of solid members not fitting together properly, they noted. Such a discharge, they added, can be detected by ear or eye, although an inspection usually involves de-energizing and dismantling the equipment. They noted that corona discharge also takes place across voids in solid insulation and across microscopic bubbles in insulating liquids.

Southeastern Power Plants Schedule 1965 Openings

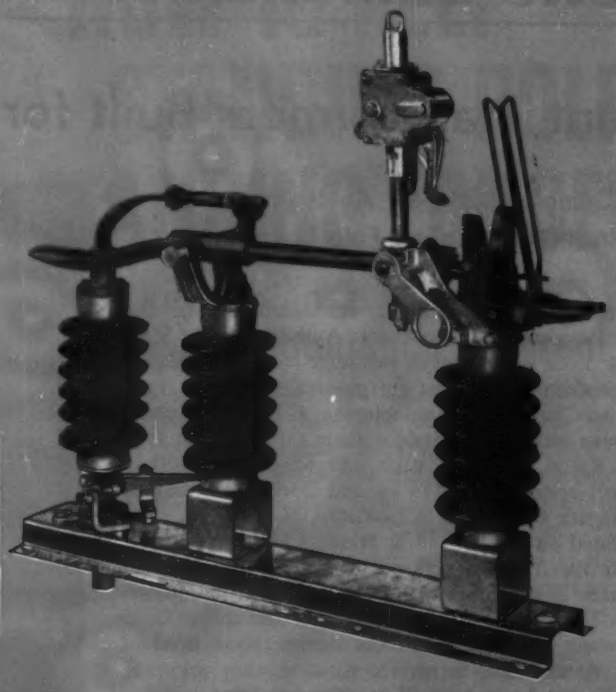
New generation in Southeastern US will take a giant step forward in 1965. Independent plans for three new power plants have set this year as a target date.

Virginia Electric & Power Co will build a huge station at Stoney River near large supplies of coal. Ultimately, the plant will turn out 1,000 Mw and will cost at least $150 million. First unit of 250 Mw should be on the line in 1965.

Georgia Power Co's $42-million station on Lake Sinclair will begin operating in 1965 at 250 Mw, but is designed to grow into a 1,750-Mw giant. The company will also add a 125-Mw unit to its Mitchell plant.

Vepco and Georgia Power cited rapid economic growth as the reason for the new stations.

NEW!
from Kearney



ARI-60 ..a distribution load break switch with power class features

The ARI-60 will greatly extend flexibility in system switching with low cost interruption of load, line charging, magnetizing or capacitive currents. Exhaustive testing in the Kearney Laboratory has proved consistent interrupting ability up to full 600 ampere rating.

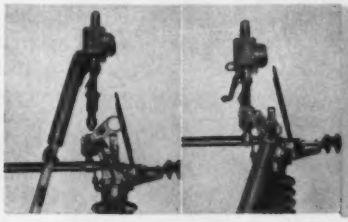
PRICE? You'll be pleasantly surprised . . . this is the answer to low cost load switching.

ARI-60 Specifications and Features

- High Speed interruption independent of operator.
- Simple Hot Stick replacement of interrupter.
- Interrupts load currents to 600 amperes without external arc.
- Rotating blade breaks ice, dirt, or corrosion.
- High pressure silver-to-silver contacts.
- Weatherproof rotating stack . . . stainless steel ball bearings.

Featuring the

ARCO INTERRUPTER UNIT



Simply and easily replaced in any position with a hot stick, cannot be installed incorrectly. Locking action holds unit so it can't vibrate free . . . *tested to 50 full load operations.*

For full details ask for Bulletin Section 8c.

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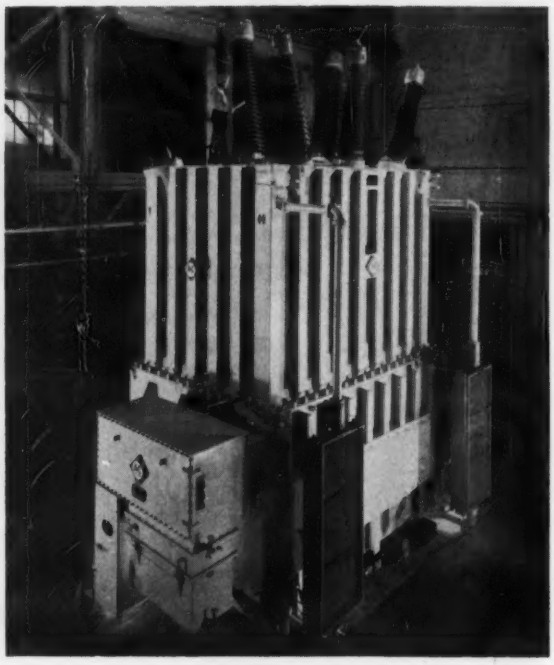
Giant Transformers Built for Power in North

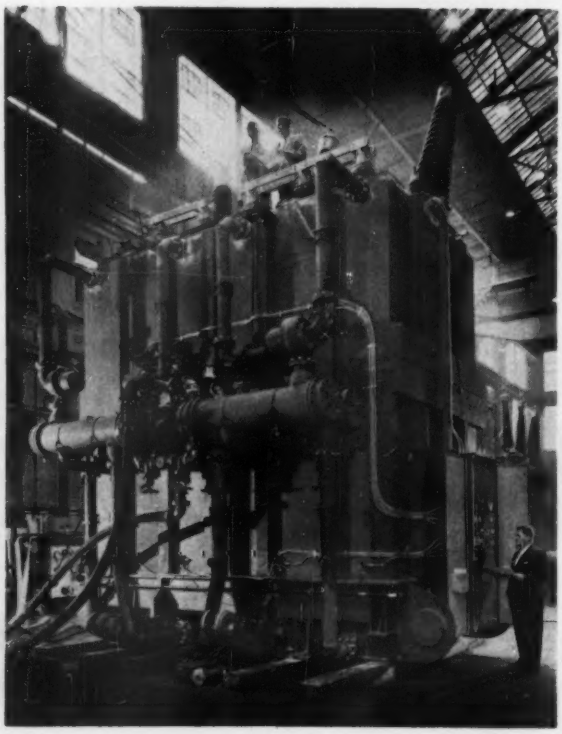
A-C Complete 345-Kv Autotransformer for PASNY's Niagara Falls Switchyard



Scheduled for second-quarter installation at the Niagara switchyard of the Power Authority of the State of New York is this first of two huge load-tap-changing autotransformers—largest (in physical size) ever built by Allis-Chalmers Manufacturing Co. These units also have record capacity for their extra high voltage class. Rated 400 Mva, each unit weighs 730,000 lb and will connect the 345-kv and 230-kv sections of the Niagara switchyard at Lewiston, N. Y.

Located on the plateau at Niagara Falls, the station is near the Tuscarora Power Plant for which Allis-Chalmers is furnishing 12 large reversible pump-turbines. The pumps are each rated to deliver 3,400 cu ft of water per sec against the storage pond head of 85 ft. As turbines, in reverse rotation, they are each rated 28,000 hp under a 75-ft operating head.

Power will be channeled through these transformers across New York State on the Power Authority's 345-kv system connecting with Rochester Gas & Electric Co. Just north of Utica, the line will have connections with the 345-kv line being built to New York City.



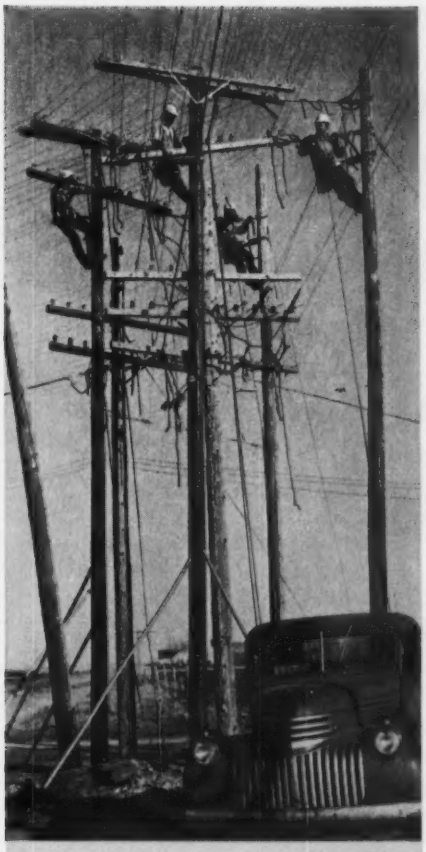
Canadian Westinghouse Transformer Tested for Ontario-Hydro Lakeview Power Plant

This massive transformer (about 250 tons, 21 ft long, 15 ft wide and over 30 ft high) is shown undergoing tests in the Hamilton, Ont., plant of Canadian Westinghouse Co, Ltd, prior to shipment to Hydro-Electric Power Commission of Ontario's Lakeview steam generating plant.

This and a duplicate unit to be shipped later to the station are said to be the largest and most efficient such transformers to be built in Canada. They will step up power generated at 15.2 kv to 230 kv for transmission to the southern Ontario system. Each 15.2/230-kv, 340,000-kva, 3-phase, 60-cycle unit has capacity to supply the domestic power needs of the combined populations of Vancouver, Winnipeg, Ottawa and Halifax. It is reported by the manufacturer that these transformers have an efficiency in excess of 99.7%

Units were designed for shipment on a special rail car, the "Schnable," which allows each unit to serve as a center section of the car, moving barely 6 in. above the rails.

(*More News of Manufacturers, p* 58)



Planned maintenance can delay for many years the expense of placing new poles.

HOW TO KEEP STANDING POLES STANDING LONGER

Three keys to an effective preventive maintenance program

Because of the continually mounting expense of setting new poles and transferring fixtures, there is no longer any doubt of the value of planned pole maintenance. Experience of utilities pioneering such work proves that supplemental preservative treatments will extend pole life many years . . . stretching maintenance dollars and deferring capital expenditures.

Success of such a program is dependent upon: 1) Regular and thorough inspections of standing poles. 2) Treatment as necessary with preservatives designed for this specific purpose. 3) Keeping accurate records of inspections and treatment.

The most widely used preservative products for pole maintenance are manufactured by Chapman Chemical Company. They contain pentachlorophenol, the superior wood preservative which gives proven results in preventing decay and insect attack.

With specific products for pole maintenance needs and broad experience in this field, Chapman can help you establish a complete program to insure best results at least expense.

USE THESE CHAPMAN PRODUCTS FOR SUCCESSFUL POLE MAINTENANCE

Pol-Nu® Preservative and Bandage-Maker

Pull out Pol-Nu bandage...wrap around pole.

Chapman Pol-Nu is a patented grease-type preservative containing a full 10% pentachlorophenol in solvent oils which meet AWPA specifications. It gives excellent penetration, is not water soluble. Pol-Nu is used for ground-line treatment and to prevent decay in checks and cracks above ground.

The Chapman Pol-Nu Bandage-Maker is a unique, portable device which prepares ground-line treatment bandages in the field. It insures a uniformly accurate Pol-Nu preservative application on every pole that is treated.

Pol-Nu Pak

Convenient ground-line treating bandage containing Pol-Nu. Factory-sealed envelope insures proper amount of preservative, is easy to apply. Handy for spot treating and "change-outs" as well as full-line treatment.

Pol-Kap and Applicator

The Pol-Kap is a permanent preservative topping for poles which seals out moisture and releases pentachlorophenol into wood to kill decay. Easily, safely applied with special applicator which locks on end of hot stick.

Penta Plus 40

Oil solution of pentachlorophenol for full-length pole and cross-arm spraying, and brush or soak treatments at retirement yards. Penta Plus 40 restores preservative protection economically.

CHAPMAN®

CHAPMAN CHEMICAL COMPANY

Leading manufacturer of wood preservatives

Memphis 1, Tenn.

Mail coupon for information

Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

Please send complete information on products for pole maintenance to:

Name_____

Company_____

Address_____

Crapo GALVANIZED

STEEL STRAND

Mandrel Test*

Checked and Double-Checked by Laboratory Technicians

Every coil of wire used in the manufacture of *Crapo* Galvanized Steel Strand is tested and approved by trained laboratory technicians. Samples from both ends of each individual coil are subjected to a series of prescribed tests before stranding. Then, the finished strand is re-checked to make certain that it conforms in every respect to established specifications and our own high quality standards.

Thus you know when you specify *Crapo* Galvanized Strand that every precaution has been taken to assure maximum performance in the finished product.

Write for Free Booklet

"The Story Behind Crapo Galvanized Wire and Strand" illustrating and describing manufacturing techniques and testing procedures. Ask for Booklet B-59!

AVAILABLE IN 3 COATING WEIGHTS

FOR GUYS, MESSENGER AND OVERHEAD-GROUND WIRE

Crapo Steel Strand is available in all standard sizes and grades and in Class A, B and C galvanized coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.

Muncie, Indiana

Contracts Awarded for 345-Kv Niagara Lines

Niagara Mohawk Power Corp announced last week that Emerson-Garden Electric Co, Inc, has been awarded a $3-million contract to construct the 345-kv transmission line from Utica (EDIC Station) to Albany (New Scotland Station); and that Collyer Construction Co, Cleveland, Ohio, was awarded a $2-million contract for constructing the 345-kv lines from New Scotland south to, but not including, the Hudson River crossing near Hudson, N. Y. Contract bids for constructing the balance of the line south to Con Ed's Dunwoodie Station, including the river crossing itself, are still being evaluated—it is expected that an award for this portion will be made next week.

Equipment contracts were also awarded to manufacturers:

- Conductors — $1,000,000, split between Aluminum Company of America and Anaconda W&C Co;
- Towers—$2,000,000, Bethlehem Steel Co;
- Insulators, corona rings, line hardware—$750,000 split among: Lapp Insulator Co (Insulators and grading rings); Porcelain Insulator Co (Insulators); Preformed Line Products Co (Line hardware).

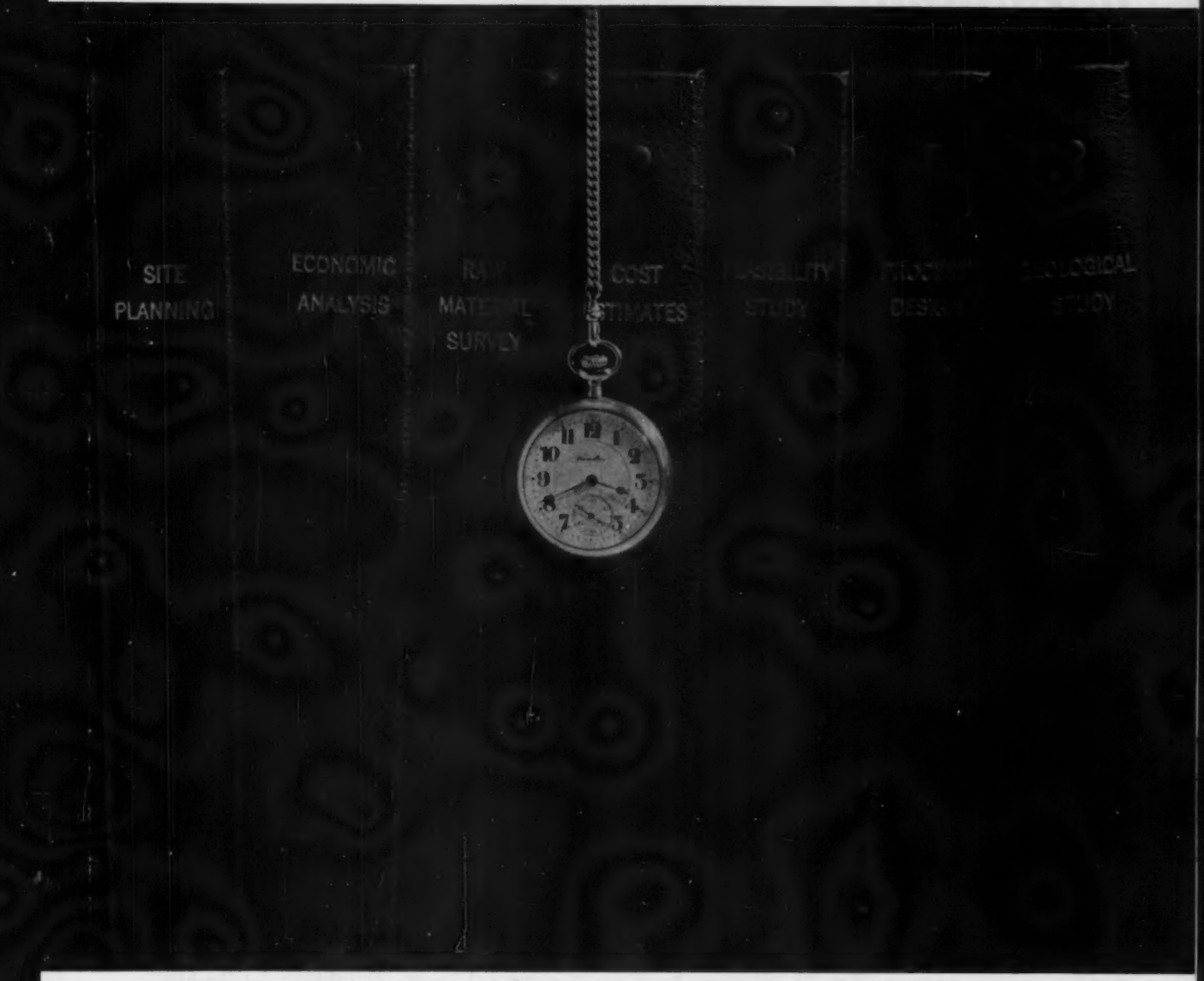
Creepage Increased On 69-Kv TBI Bushing

Increased creepage distance and a standard appearance are incorporated in General Electric Co's redesigned TBI (Transformer Breaker Interchangeable) 69-kv bushing.

The redesign, now being phased into production by the company's bushing products section, Pittsfield, Mass., consists of a change from the former metallic dome with mechanical oil gage to a glass dome with visible oil level. According to GE, this increases the insulation distance from the top of the bushing to ground (creepage distance) because the thick-walled glass dome is bonded to the top porcelain and therefore becomes part of the insulation structure. This change gives the 69-kv bush-

(*Continued on page* 60)

Pre-Engineering by **KAISER ENGINEERS** answers basic plant expansion questions...



Timely? Many complex factors shape the final decision to proceed with your expansion plans...and timing is an important one. Independent analysis of all aspects of your proposed program is the *Pre-Engineering* service offered by Kaiser Engineers. The studies and evaluations furnished by KE Pre-Engineering represent only one phase of total KE services. Kaiser Engineers designs and builds all types of power plants—steam-electric, gas turbine, combined cycle, nuclear, and hydro-electric. From Pre-Engineering through design and construction, Kaiser Engineers provides complete, one-company service and ingenuity based on years of experience.

KAISER ENGINEERS

KAISER ENGINEERS engineers-contractors
Contracting since 1914

Oakland 12, Calif. — Chicago, New York, Pittsburgh, Washington, D.C.
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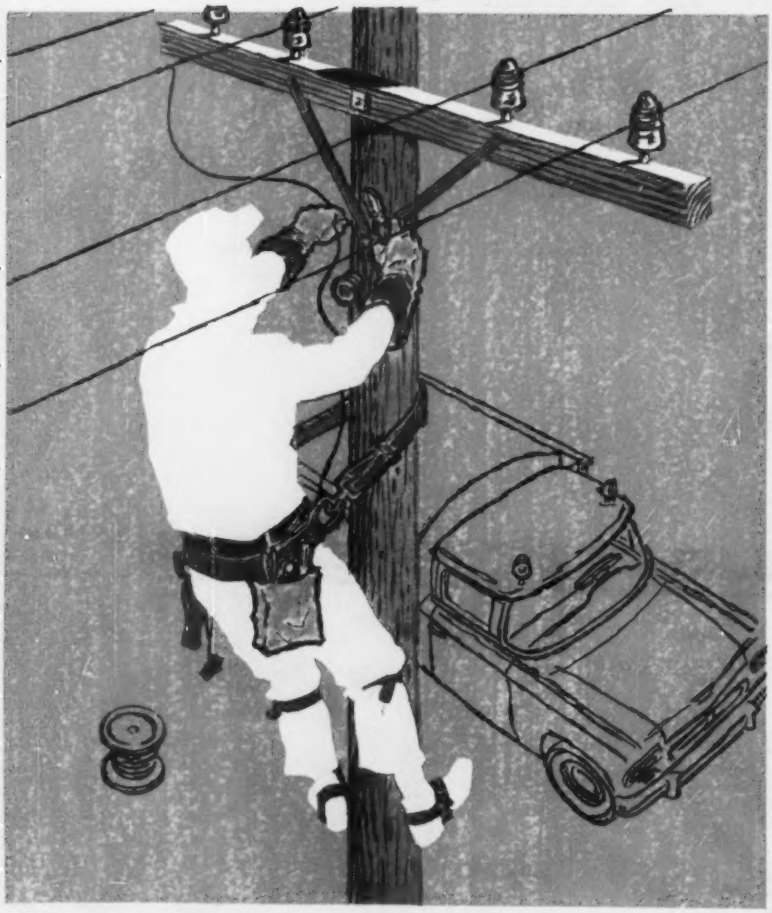
6228-P

personnel? --or personnel problems?



Next time you need line crews, consider the advantages of using a qualified contractor's facilities. You'll spare yourself the usual headaches of hiring and laying off, employee processing and training, absenteeism, etc. For special projects—or on a long range basis—the qualified contractor offers:

- the skills and equipment you need *when and where* you need them
- precise cost accounting
- reduced equipment overhead
- firm job completion dates and written performance guarantees

In addition, he can probably do the job at less cost to you. For names of NECA contractors, write

NECA

National Electrical Contractors Association, 610 Ring Building, Washington 6, D. C.

(*Continued from page* 58)

ing the same appearance as the 23, 34.5 and 46-kv bushings.

These four bushings, plus four higher voltage metallic-dome bushings, form the company's TBI bushing program, which provides ASA Standard bushings completely interchangeable between power transformers, medium transformers and oil circuit breakers in the 23-kv to 196-kv range.

GE says the new 69-kv bushing is interchangeable with the TBI bushing which it replaces. When used on breakers, the bushing's central tube serves as the conductor and can carry currents up to 1,200 amp. When the bushing is used on transformers, the transformer lead can be drawn up through the tube and pinned to the top terminal. The bushing has a 400-amp top terminal for transformer use.

MANUFACTURERS BRIEFS

• **Radio Corp of America** has been awarded a contract for microwave equipment for a seven-station system linking Indiana & Michigan Electric Co's new Breed generating plant near Fairbanks, Ind., with other company facilities. The 2,000-Mc system will cover approximately 200 miles, connecting at Marion, Ind., with an existing nine-station RCA system which provides communications to Fort Wayne and South Bend.

• **Babcock & Wilcox Co** has received notification from the Atomic Energy Commission that the latter will allow B&W to modify a critical facility for nuclear-power experiments for its spectral shift development. The changes for the Lynchburg Source Reactor will allow heavy-water concentrations higher than the previous limits—50% and 80% for different fuels.

• **Ebasco Services Inc's** central regional office in Chicago has consolidated with **Business Research Corp,** one of the oldest management consulting firms in the Midwest. Business Research will operate as an integral part of Ebasco's Midwest management consulting Chicago organization, with BR's Paul T. Weldon continuing as president.

Your Hole-Boring Equipment Lets You Install Chance Screw Anchors Almost Anywhere in 5 to 8 Man-Minutes

Your present boring equipment, regardless of type, can be adapted to power anchor installation simply by using a special Chance wrench that transmits torque from the digger directly to the hub of the anchor helix. Then, your crews are set to install anchors in 5 to 8 man-minutes . . . *from the time the equipment is moved into position until the anchor is ready for the guy.* (By adding a screw anchor adapter, the installation wrench can be attached without removing the auger bit.)

Chance Power Installed Screw Anchors go down fast, uniformly . . . anywhere that you can bore a pole hole with your power hole-digging equipment. Slow, tedious labor is eliminated. So, too, is error caused by human variables. Line construction is speeded, and you realize more on your investment in hole-boring equipment. Since the anchor rod itself is not subjected to torque, it only has to be heavy enough to support the guy load. That's a cost-saving factor, too.

Chance Screw Anchors range in size from 78 to 176 square inches in area. Their sharp cutting helixes of high-strength structural steel are tapered to minimize earth disturbance. Hundreds of installation and pull tests prove that Chance Power Installed Screw Anchors hold with less creep than any other anchors of comparable size. So, isn't it time for you to consider the advantages of mechanization of screw anchor installations?

Use Chance Power Installed Screw Anchors and get:

- Lower installation costs per anchor
- Better utilization of expensive equipment
- Greater holding power with less creep
- Consistent results
- Elimination of human variables
- Less physical effort, better employee relations

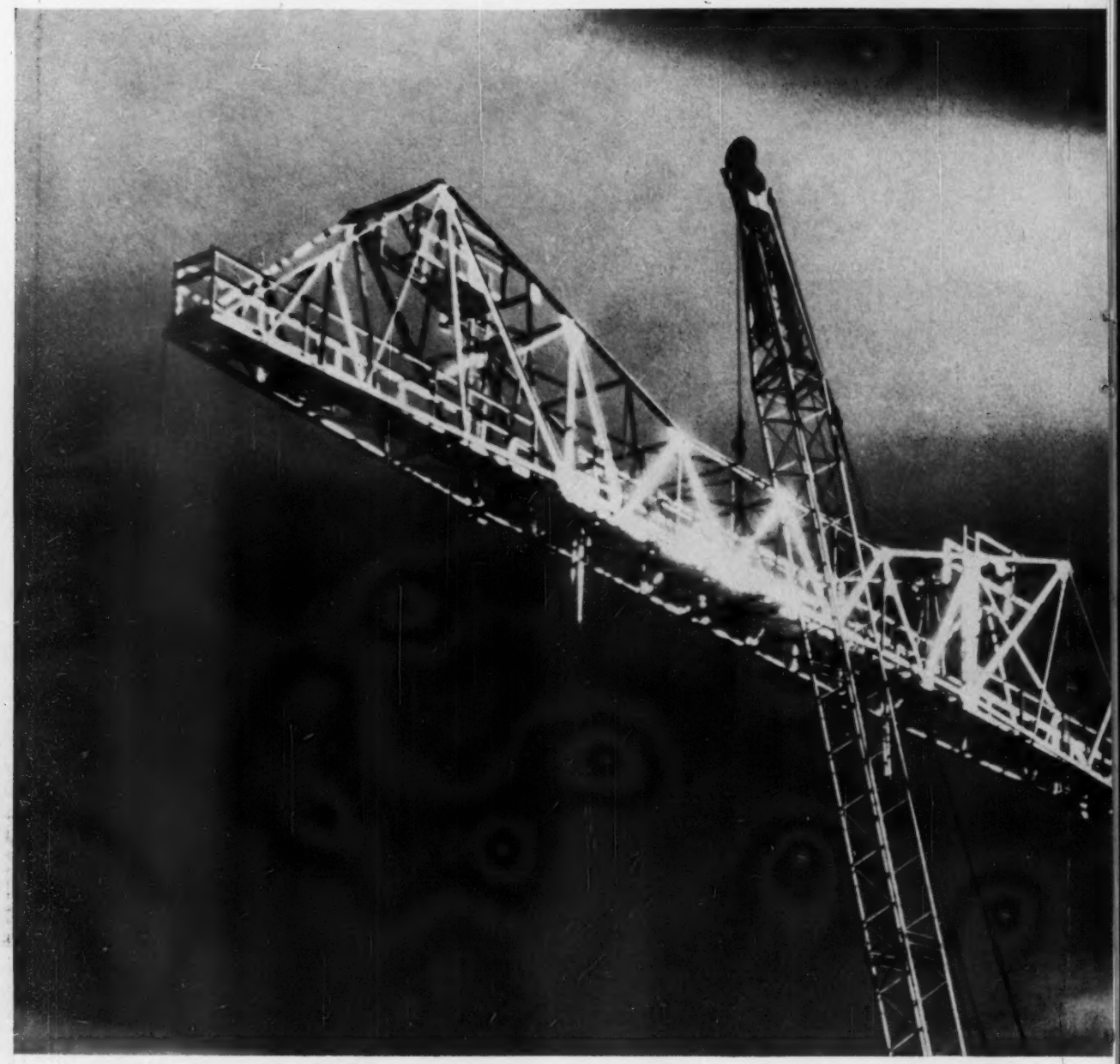
Contact your Chance Representative. He'll show you how you can apply this new anchoring technique to save time, cut costs, and improve your anchoring.

ABC INDUSTRIES

A. B. CHANCE COMPANY

CENTRALIA, MISSOURI (A. B. Chance Company of Canada, Ltd., Toronto)

CA60-31



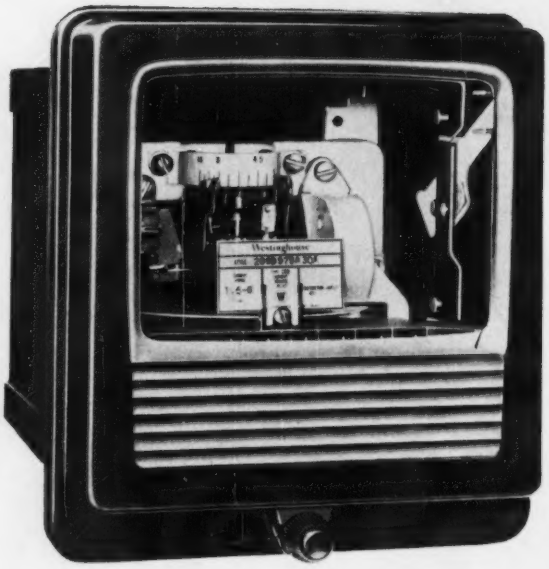
Alcoa Structural Division designs and fabricates aluminum towers that can be erected fast—often in a matter of hours. Lightweight aluminum towers (and substation structures) can be manufactured economically and require no maintenance.

Write: Aluminum Company of America, Structural Division, 871-D Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM
STRUCTURAL DIVISION

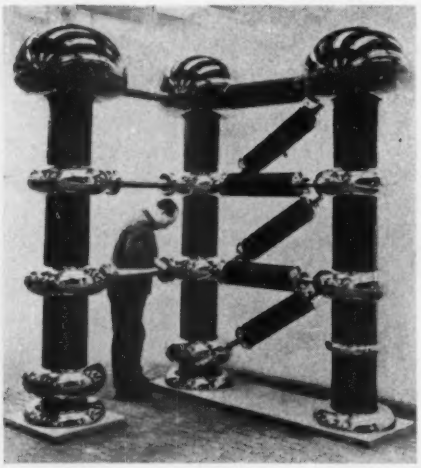
New Equipment

Current-Sensing Relay . . .



. . . has independently adjustable high and low-current stationary contacts for switching and control operations. Type COD is available with either a tapped or a nontapped electromagnet. The tapped relay is supplied in 0.5 to 2.5, 2 to 6, and 4 to 12-amp ac; the scale is marked in percent of tap value with a range of 80 to 110%. The nontapped unit is available with a range of 0.5 to 2.0, or 1.5 to 6-amp ac; the scale is marked directly in amperes. Minimum setting between the high and low-current contacts is 3% of tap-value current for the tapped relay; 0.1-amp ac for the relay without taps. Burden of the tapped relay is 2.38 va at tap-value current for minimum setting; burden of the nontapped relay is 0.48 va at minimum, 7.6 va at maximum setting.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

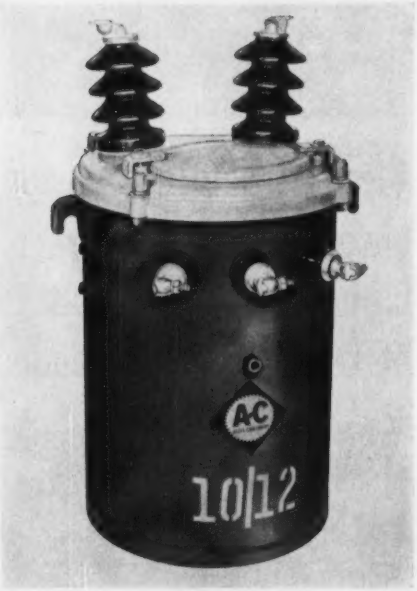


Hv Rectifier Stacks . . .

. . . are rated up to 636,000 peak inverse voltage. Type shown here is utilized (in zig-zag) in a rectifier assembly capable of delivering 600 kv at 20-ma dc by means of a Crockroft-Walton multiplier circuit. Each of the six air-cooled rectifiers in this installation consists of 26 ring-type, high-voltage units assembled in series to give the desired stack voltage; each is rated 97.5-kv rms, 275,000 peak inverse voltage, 20-ma dc half-wave capacitive load.

Siemens Schuckertwerke, Wermer-von-Siemens-Strasse, Erlangen, West Germany

Distribution Transformers . . .



. . . provide greater overload capabilities through larger cooling duct area, higher temperature insulation, and higher temperature oil. The Endur-All dual-rated line covers all pole-type units, 2,400 v through 18 kv, 5/6 to 500/560 kva referred to ASA-NEMA Standards—including all component arrangements. Units of 4,800 v and below are available with sidewall bushings; units of 7,200 v and above are offered with cover bushings. A distinctive locked core-and-coil assembly provides high short-circuit strength and does away with all nuts, bolts and welds; there is nothing to loosen or shake free. The transformers are smaller in size and weight for easier handling and hanging. Optional features include a new high dielectric, track-resistant, molded glass-filled polyester series-multiple switch with a non-removable external handle, also a Thermalite overload indicator—coordinated with 65C rating to allow fullest utilization of capacity.

Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.

kill contamination!

spray on INSULGREASE* *for*

LOCKE† Insulator getting Insulgrease protection.

(Photo courtesy Power Authority of the State of New York, Niagara Power Project. Consulting Engineers: Uhl, Hall and Rich)

FAST, COMPLETE PROTECTION

Here's the newest, fastest way to get positive, low-cost protection against insulator contamination . . . simply spray on easy-to-use Insulgrease silicone coating. Pictured above is the huge Niagara Switchyard of the Power Authority of the State of New York. It covers 48 acres . . . contains 21 bays of 115, 230 and 345 kv equipment. Here, by attaching pressure equipment to drums of Insulgrease, protection against contamination was quickly sprayed on the insulators. With Insulgrease, there was no gumming up, no overspray, no fogging, no wasted material—just lasting protection. When needed, another spray application . . . right over the first layer . . . will restore original characteristics.

INSULGREASE—THE POSITIVE ANTI-CONTAMINANT

Dual-action Insulgrease silicone coating repels water and absorbs contaminants to give thorough protection. Spray over any dry surface—clean or contaminated—to any thickness. Insulgrease resists oxidation, moisture, salt spray, fungi, chemical attack, heat, cold and ultra-violet rays.

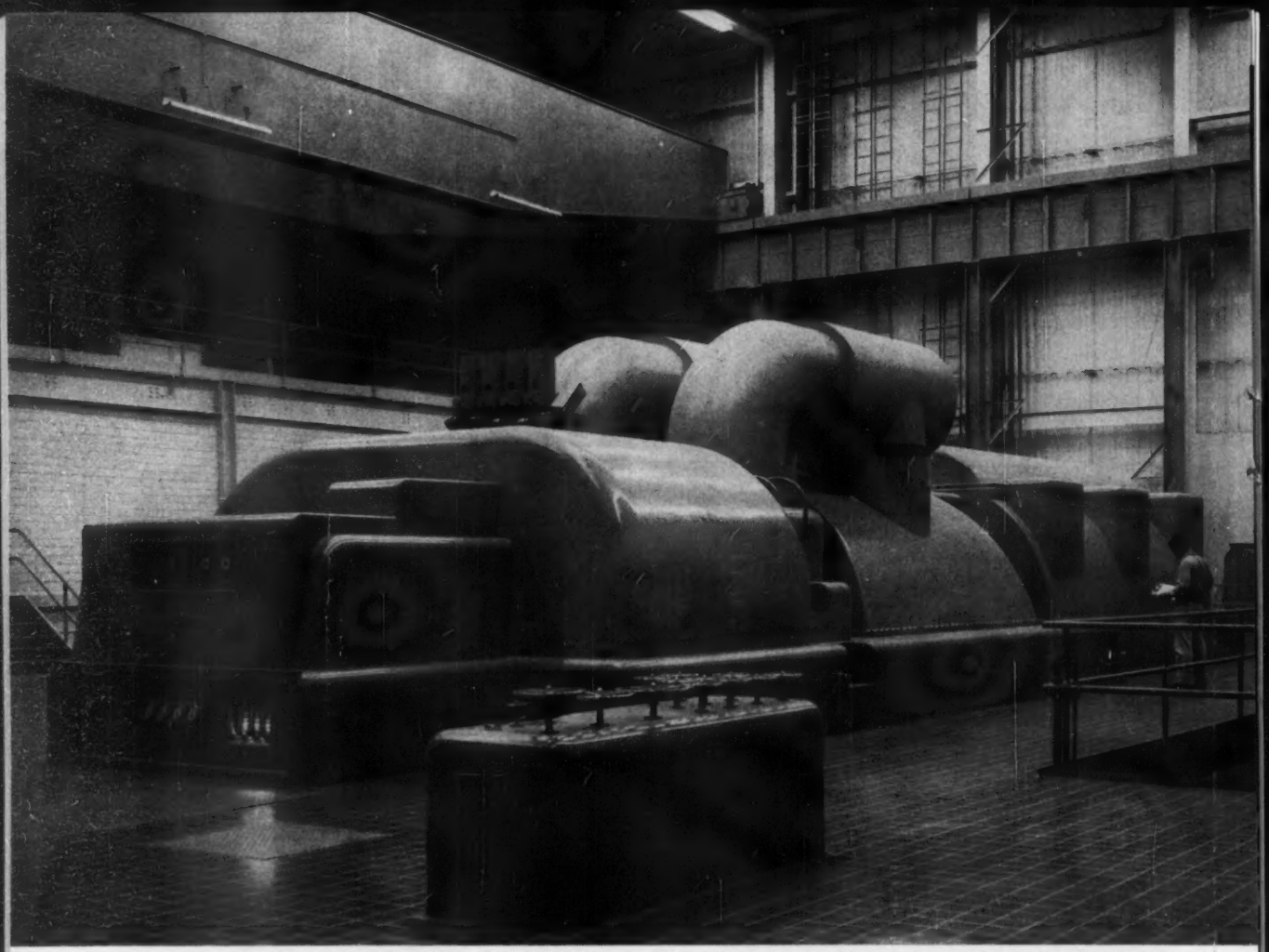
Get the full details on Insulgrease protection now. See your LOCKE Insulator representative, or, for technical literature and sample of Insulgrease, write to:

Insulator Department
General Electric Co., P. O. Box 57
Baltimore 3, Maryland

Progress Is Our Most Important Product

GENERAL ELECTRIC

*Registered Trademark of the General Electric Co.
†Trademark of the General Electric Co.



Complete service complements product reliability when you install a General Electric steam turbine-generator such as this 125,000-kw, tandem-compound, double-flow, reheat unit in the E. D. Edwards Station of Central Illinois Light Company

Always an evaluation factor— General Electric's personalized turbine-generator service

General Electric's complete service program for steam turbine-generators is personalized to your specific system requirements—to help you in your continuing efforts to produce reliable, low-cost electric power. This nation-wide service is readily available, to give you:

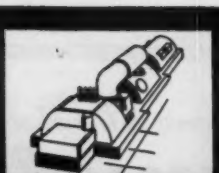
- turbine and generator engineering consultation
- installation planning and direction
- accelerated, on-time start-ups
- training of your personnel
- periodic service calls and consultation
- maintenance inspection and planning
- renewal parts scheduling
- priority repair service

At General Electric, service is always part of the total value you receive . . . it is not curtailed when prices are soft, when orders are slow, when profits are down . . . it is *always* part of your steam turbine-generator. 244-02

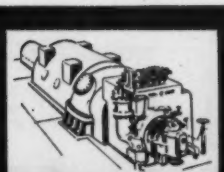
Progress Is Our Most Important Product

GENERAL ELECTRIC

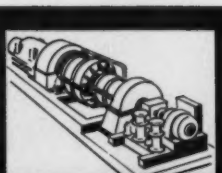
General Electric Turbine-Generators Help Keep Power Costs Low



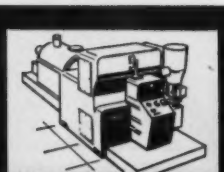
Steam turbine-generators for large blocks of power



Steam turbine-generators 100,000 kw and lower



Gas turbines for peaking, base load, combined cycles

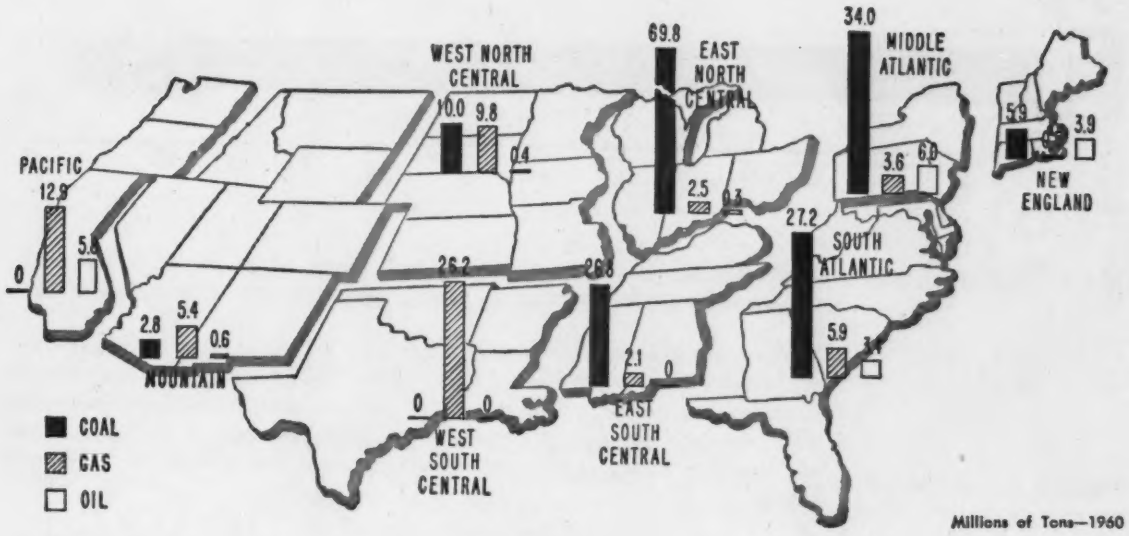


Mechanical drive steam turbines for auxiliaries

Electrical World

APRIL 10, 1961

Management Newsletter



Survey Shows Fuel Consumption in 1960, and . . .

Five-Year Utility Fuel Forecast

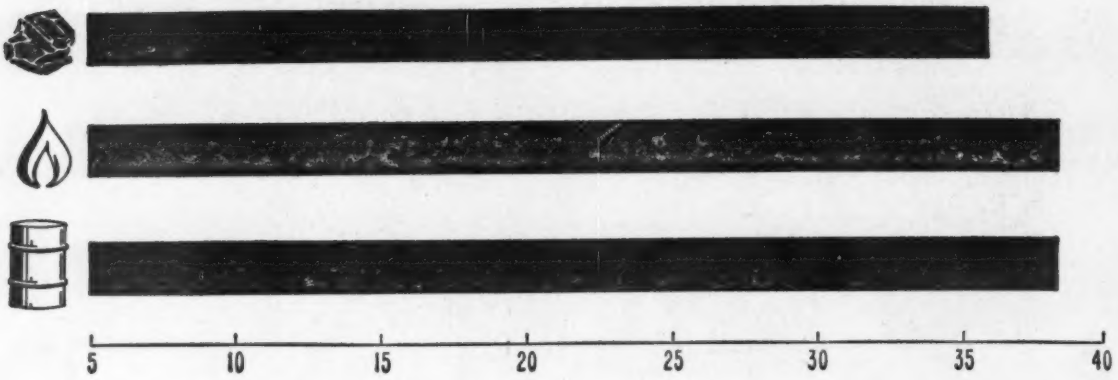
Utilities have enormous appetites for fossil fuels. In 1960, the nation's electric power industry consumed 265.8 million tons of coal, oil, and gas. By 1965 it will take an additional 97.7 million tons a year to keep them going, bringing the annual fuel usage up to about 363.5 million tons. Tonnage of gas and oil is measured in coal equivalents. The quantity of these fuels that produces the same amount of heat as a ton of coal is considered a ton of gas or oil.

Coal demand will increase in all regions except the West South Central and Pacific where no coal is used at present. It will continue to dominate the country east of the Mississippi, an area which burns 92% of the total utility coal. Coastal regions from Delaware north are using increased amounts of oil brought by ship to tidewater plants. Oil still dominates the Florida market despite inroads being made by both coal and gas. Gas pipelines are reaching into the southern tier of states from Mississippi to South Carolina, and into scattered cities to the north including Memphis, St. Louis, Louisville, Chicago, and Detroit. But the amount of gas delivered in this area is insignificant when compared with the quantities of coal used to generate power.

Gas rules the West South Central region which qualifies as the only single fuel area of the country. This area will also account for more than half of the increased demand for gas in the next five years.

Oil gains are concentrated in Florida and in California, and to a lesser extent in the Northeastern coastal states. Most utility oil is imported so that the domestic

PERCENTAGE INCREASE IN FUEL USE BY 1965



oil industry has little interest in utility fuel. Some oil, of course, is used in all coal burning areas for warming up, but this is less than one million tons per year.

The five-year forecast shows that coal will hold its present share of the fuel market. Since oil and gas first found their way into utility boilers, they have steadily increased their position at the expense of coal producers. But between now and 1965, the difference in growth rates of the three fuels will be negligible. Coal will take the same percentage of the new business that it holds in the present market.

McGraw-Hill's Keystone Coal Buyers Manual provides these estimates on the basis of reports from the utilities themselves. Keystone's Eighth Annual Survey of Fuel Use brought replies from users of 89% of the coal, 76% of the gas, and 56% of the oil. The five-year estimates covered 59%, 50% and 31% of the utilities using the respective fuels. No allowance was made for political decisions, such as changes in oil import quotas, or railroad rate schedules, which might materially affect the supplies and prices of the fuels. According to Keystone, here's what's happening in the nine regions of the country:

NEW ENGLAND—projections favor coal

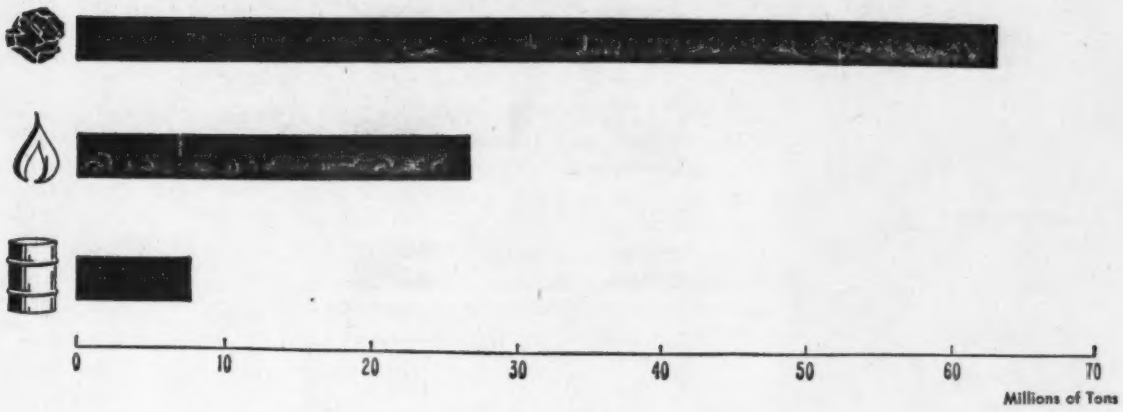
With a low percentage of complete returns, increased fuel demands add up to 1.8 million tons for coal, and 0.4 million tons for oil. Gas will do well to hold its present customers. Maine keeps its status as a 100% burner of oil, while the coastal areas use triple fuel units. 1,500 Mw of new capacity are on order with half of them going to coal, and the remainder using coal along with one or both of the other fuels. Three small units being built in Maine will follow the state tradition and burn oil. But these are exceptions to the movement toward coal for firing the new capacity.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	5.9	7.7		3.9	4.3		0.5	0.5

MIDDLE ATLANTIC—hydro making inroads

Hydro, for the first time, is causing a cutback in coal usage. Upstate New York utilities, Niagara-Mohawk, New York State E&G, and Rochester G&E, will cut coal purchases in 1961 and 1962 by about two million tons. By 1963, however, the pattern of annual growth in coal demand will be restored. In 1965, coal sales to utilities will have increased by 20% against 15% for oil and 10% for gas. Foreign oil will continue to find its market in the tidewater plants, and gas will probably be used only by combination utilities which are

TONNAGE INCREASE IN FUEL USE BY 1965



unable to sell the full quota for which they have contracted. Inland plants in these states will continue to be 100% coal burners.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	34.0	40.8		6.0	6.9		3.6	4.0

SOUTH ATLANTIC—gas losing ground

Oil burning will more than double. This gain will be concentrated on Florida's Atlantic coast with three utilities, Florida Power, Florida P&L, and City of Jacksonville, accounting for almost all of the four-million-ton gain. Gas, in Florida, has no real growth in the offing. What's more, the Atkinson plant of Georgia Power Co, the largest gas burner in this area, has just recently switched to coal. 6,270 Mw are now on order, and of these plans, those including coal handling equipment predominate. In fact, the growth of coal in the next five years may be as much as 40%. Delaware P&L's new 66-Mw unit scheduled to go on the line in December of this year will be the first in the nation to burn petroleum coke and oil.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	27.2	38.1		3.4	7.4		5.9	6.0

EAST NORTH CENTRAL—coal in command

These five states account for more than 27% of all the utility fuel used in the nation. Coal predominates, with gas used only in a few plants in the Chicago, St. Louis, Toledo, and Detroit areas. In Chicago, gas use declined during 1960 from 2.2 million tons to 1.4 million tons, and is projected to remain at this level. However, Canadian gas may come on strong in this region, particularly in Wisconsin. One Wisconsin utility is planning to go to gas in 1961. But coal seems to have the further growth of the area well in its pocket. There are 7,100 Mw on order. Gas-coal, oil-coal, and nuclear fuels will account for about 800 Mw of this new capacity. The rest of the units are pure coal burners.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	69.8	90.8		0.3	0.3		2.5	3.4

EAST SOUTH CENTRAL—TVA coal plants dominate

Tennessee Valley Authority will build the biggest part of new capacity in the region, about 3,100 Mw. All this will be in coal-fired plants. Coal will also fire the 1,400 Mw projected by Southern Electric Generating, Alabama Power, and Kentucky Power. These units promise coal a 50% increase in the next

five years. Gas will decline in this region except in Mississippi where its future in the five-year forecast looks very bright.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	26.8	40.2		0	0		2.1	2.9

WEST NORTH CENTRAL—coal, gas neck and neck

North Dakota burns its own indigenous lignite with the exception of one small unit (12 Mw) which burns gas. Kansas and Nebraska, on the other hand, burn more than 90% gas. The other four states use coal and oil about 50-50. Coal promises to increase its percentage of the market in Iowa and Missouri. Canadian gas may be the big influence in Minnesota. Minnesota P&L is presently switching to gas for about 30% of its fuel. Some 3,623 Mw are on order with about half of these in Iowa and Missouri. Coal seems to be gaining a bit faster than gas in firing the new capacity.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	10.0	14.4		0.4	0.6		9.8	13.3

WEST SOUTH CENTRAL—gas only

This is 100% gas territory with almost a 60% gain in gas use projected. Orders total to 5,000 Mw. Oil may take a very small percentage and is therefore threatening the single fuel status of the region. But this threat is more to the gas producers pride as sole suppliers than it is to their market. Anything oil takes will be insignificant next to the giant growth in gas. The survey holds little promise for coal producers. Although several utilities are considering coal, and talking about providing for the later installation of coal handling equipment in new plants, there is no indication of a solid future for this fuel.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	0	0		0	0		26.2	41.4

MOUNTAIN—gas leads but coal will pull ahead

Lack of additional hydro in this area which has relied heavily on water power opens the door to additional growth in fossil fuels. At present, about twice as much gas as coal goes into the furnaces. But the forecast for the next five years indicates a swing in position. Coal, it seems, will pick up about 60% of the new capacity, and in addition will win customers away from gas. Arizona Public Service and the City of Colorado Springs have decided to switch from gas to coal, and at least one other utility is looking into the idea. Southern Nevada Power, operating the only steam plant in the state, is making provisions for future use of coal in its second unit scheduled for operation in 1961. Utah P&L's new units will be coal burning, mine-mouth plants.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	2.8	7.5		0.6	0.6		5.4	4.8

PACIFIC—haven for hydro

Hydro is king in the Northwest and is growing bigger all the time. Gas and oil will continue to fuel steam boilers principally in California. Fuel use in the state will increase but no appreciable change in the gas-oil percentage can be predicted. The availability of Canadian gas might be the determining factor. All possible methods of fueling the potential expansion are under consideration, but coal doesn't figure to dent the Pacific market even by 1965.

Figures—Coal:	1960	1965	*Oil:*	1960	1965	*Gas:*	1960	1965
(*Mil. tons*)	0	0		5.8	8.1		12.9	18.1

Utility to Integrate Lighting, Heating and Air Conditioning

Integration of the lighting, heating and air conditioning will be the chief feature of the Rochester Gas & Electric Corp's headquarters building now undergoing modernization.

When completed the building will have:

- Lighting levels of 200 footcandles, about four times higher than at present.
- Air conditioning on the second through tenth floors, instead of just on the street level as at present.
- Much of the structure's heating requirements supplied by the lighting system.

Renovation of three floors of the 10-story, 35-year-old building has been completed and the other floors are expected to be modernized within the next 12 months.

Cost of modernizing the lighting, heating and air conditioning systems in the 150,000-sq-ft structure will be approximately $1.5 million. This includes $600,000 for the lighting, or $4 per square foot, and $900,000 for the air conditioning and heating, or $6 per square foot.

The 200-ft-c lighting system has now been completed on three floors, using three different systems. After gaining experience with the three test systems RG&E plans to apply one of them to installations on the other seven floors.

Preliminary plans for the lighting called for a system which would consume five watts per square foot, approximately the amount of power required for the old incandescent system. Lighting levels were to be about 100 ft-c.

Before final plans were developed, however, the Illuminating Engineering Society recommendations for office lighting were published and RG&E decided to go to 200 ft-c.

Studies indicated this lighting level could be obtained within the power limit of 10 w per sq ft set by the utility's air conditioning engineer. This would give the building more than 13 times the lighting level of the 1926 installation for only 3.3 times the power consumption.

The system used on the sixth floor is a standard louver-all installation with single-lamp fixtures mounted above 2x4-ft grids using louvers as the shielding media. The lamps are spaced 30 in. on center, and mounted 23 in. above the louvers in a new section of the building, and 18 in. in the older section. Reflectors are used above the lamps in the new section.

The second system, on the seventh floor, features open-top, two-lamp troffers recessed in a plastic louvered ceiling. The louvers are standard type between the fixtures, and a higher density type directly under the lamps. A brightness ratio of two-to-one is obtained in this manner. The finished ceiling on this and other floors is maintained at 8.5 ft, just two feet lower than the original ceiling.

Installed on the fifth floor is the third system which features 4x8-ft elements, with four lamps in each. Between these elements, and in the fixtures themselves, white aluminum louvers have been installed.

Employee Efficiency to Increase

"We intend to use our renovated building as a demonstration area to show potential customers the attractiveness, low cost, and practical benefits of a modern, integrated lighting, heating and air conditioning system," said Leo H. East, RG&E executive vice president.

If the remodeling increases the efficiency of employees by even one percent "we estimate that the improvements will more than have paid for themselves," he commented.

RG&E believes that the benefits of higher lighting levels will more than compensate for the increased owning and operating costs. Primary among the economic considerations is the potential effect of improved lighting on increasing employee efficiency by providing conditions for faster, easier and more accurate seeing.

LUMINOUS ceiling lighting will give 200 ft-c; much of structure's heating will come from lighting

Assuming one $4,000 per year office worker for each 100 sq ft of floor area, and an increase of lighting load from three to ten watts per square foot, the utility expects it will take an improvement of worker efficiency of less than one percent to offset the increased owning and operating costs.

The new air conditioning and heating systems employ much of the absorption-type refrigeration plant installed in 1950 when the building went to fluorescent lighting.

Under-window induction units with large coil capacity are served from a three-pipe system which provides hot or chilled water as the temperature of the rooms require. Each room or area has automatic temperature control.

The lighting system will produce sufficient heat in the wintertime to meet the building's requirements except in peripheral areas. Thus, supplementary heat is required under the windows. To reduce excessive heat in internal areas, a high-pressure dual-duct air system is provided. This has individual mixing boxes for each office or zone, and diffusers located level with the bottom of the ceiling. High and low returns are used to take air back to the apparatus rooms. Return air can be reused or exhausted to the outside.

Baltimore G&E Elects Chairman, President

WOLFE

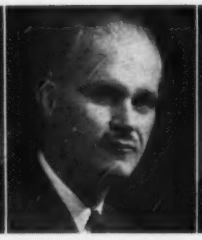
PENN

J. Theodore Wolfe has become chairman and chief executive officer of Baltimore Gas & Electric Co, succeeding Charles P. Crane who will continue as a director and chairman of the executive committee. Austin E. Penn was elected president.

Since 1957, when Wolfe and Penn became president and executive vice president, respectively, Baltimore G&E has boosted its operating revenues from $132 million in 1956 to nearly $175 million for 1960. Utility plant went from about $429 million to over $575 million by the end of 1960, while total expenditures for plant additions, which were about $40 million in 1956, came close to $54 million last year.

Four Promoted By Shawinigan

FULLER



MAINGUY

ABBOTT

WAY

Shawinigan Water & Power Co has named J. A. Fuller chairman and chief executive officer; W. F. Mainguy, president; A. C. Abbott, executive vice president; and W. R. Way, senior vice president. Robert J. Beaumont retired as chairman and was appointed honorary chairman and a consultant.

Fuller has been president since 1950. During that period (1951 to 1960) total operating revenues, over 98% of which is from electric operations, jumped from $35 million to close to $83 million. These figures include acquisitions of St. Maurice Power Corp in 1954 and Southern Canada Power Co in 1957.

Mainguy has been executive vice president since 1952. Abbott, who was also elected to the board of directors, and Way were formerly vice presidents, Abbott since 1952 and Way since 1951.

Westinghouse Electric Promotes Two

Westinghouse Electric Corp has appointed Charles W. Mills manager of market development in the apparatus sales organization. John G. Aldworth was named to succeed Mills as manager of the electric utility sales department. Aldworth was formerly sales manager of the power control and communications department.

MILLS

ALDWORTH

Mills will direct sales development activities of the apparatus marketing division and will coordinate departmental sales plans of the division with the plans of the product departments selling through the apparatus marketing division.

Both men will report to K. M. Patterson, manager of headquarters sales departments.

Day-Brite Names Nusbaum To Be Vice President

William C. Nusbaum has been appointed a vice president of Day-Brite Lighting, Inc, a subsidiary of Emerson Electric Manufacturing Co. He was formerly assistant to the president of Emerson Electric.

A graduate of Case Institute of Technology, he also holds a master's from Harvard Business School.

(*More News About People on p* 74)

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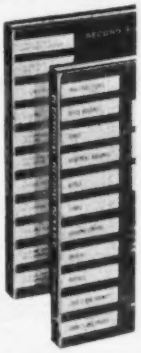

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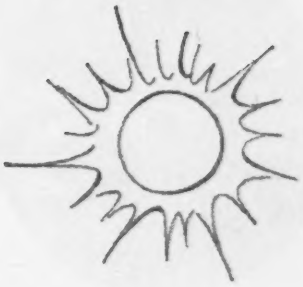

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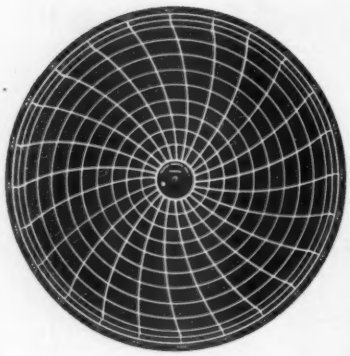

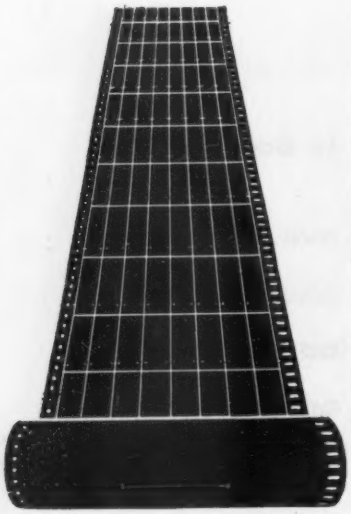

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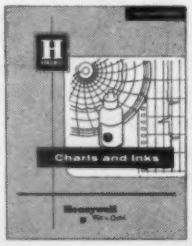

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Four Appointed by GE in Reorganized Sales Setup

General Electric Co's distribution transformer department has established a foreign and component sales operation and realigned responsibilities with its sales section.

J. O. Sweeny was named to head the newly established foreign and component sales operation; W. B. Gaither, eastern region and network sales; J. J. Farrell, central and southern sales region; and E. B. Hanson continues as western sales region manager.

PERSONAL BRIEFS

C. A. Thrasher has been appointed **Harris E. Miller's** successor as manager of Ohio Edison Co's Springfield division. Miller, also vice president and a director, retired.

Joseph G. Cors has been named engineer in charge of the Central Illinois Public Service Co's electric department transmission section.

Massachusetts Institute of Technology has named **Dr Charles H. Townes** as provost.

Col Sterling K. Eisiminger has been assigned to succeed **Col Walter L. Winegar** as Portland district engineer for the Army Corps of Engineers.

Dan Jolly, a Franklin County, Wash., PUD commissioner, has been named president of the Northwest Public Assn.

At Electrical Testing Laboratories, Inc, **Gordon Thompson,** vice president and chief engineer, has become technical director. **Ernest H. Salter** became chief engineer; **Roger J. Amorosi,** assistant to the chief engineer; and **A. R. Chick** was appointed manager of the photometric laboratory.

Ebasco Services Inc has named **Arthur W. Flynn** as a nuclear engineer. **Lewis C. Maull** became manager of management consulting services for the south central regional office, and **Larry J. Aubrecht** became western regional operations director, succeeding **H. K. Brecken-**

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ridge who was assigned to the New York office.

Carolina Power & Light Co has elected to the board of directors **Hugh G. Isley,** general sales manager, and **Shearon Harris,** associate general counsel.

E. E. Fournace, assistant to the general manager, and **Robert W. Osterholm,** commercial manager, both at Ohio Power Co, have been elected directors of American Electric Power Service Corp.

A. H. Lewis has been appointed assistant comptroller of Georgia Power Co.

Recently at General Electric Co's large steam turbine-generator department, **Dominic P. Timo** was promoted to manager of the turbine structural engineering component, and **Markus A. Eggenberger** to turbine control systems engineer.

Richard L. Heckman became manager of product planning and **Dann W. Denny** became product planning specialist, both in GE's appliance control department.

GE has formed a bushing product section, with **N. Eugene Dillow** as general manager. **Thomas J. March** was named manager-sales operation, internal automation operation of the industrial electronics division. GE's new manager-N reactor (NPR) at Hanford is **W. M. Mathis.**

Thomas L. Mayes Jr became manager of original equipment manufacturers sales at GE's general purpose control department. **Donald J. Harrington** was appointed manager of marketing in the capacitor department, succeeding **J. T. May** who became manager of marketing administration and research.

OBITUARIES

Samuel Ferguson Jr, 56, vice president of Hartford Electric Light Co . . . **Harry M. Simon,** 79, former chief of the Philadelphia Electric Bureau . . . **William B. Crombie,** 74, engineer who built and managed several Ontario hydroelectric projects . . . **Ernest Leon Dee,** 75, retired manager of General Electric Co's lamp department.

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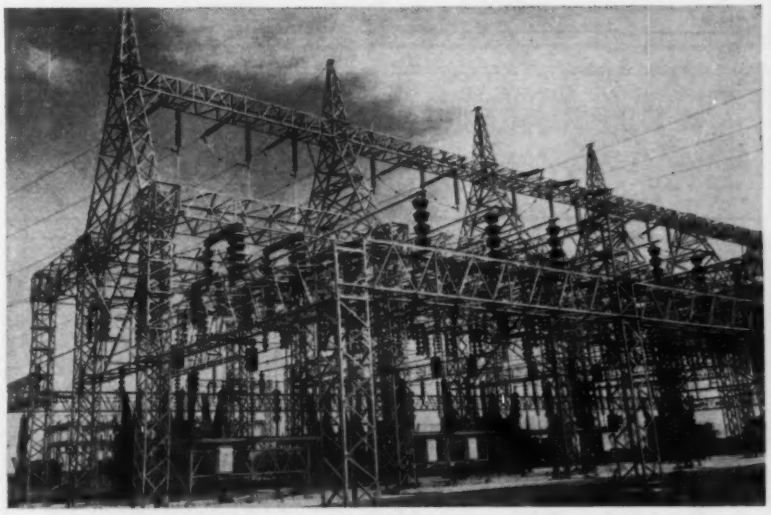

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4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—1000 KVA G-E 34500-7200/12470Y
3— 500 KVA G-E 34500-2400/4160Y
3— 833 KVA W-H 43800—480
3— 667 KVA G-E 13800—2400
3— 333 KVA W-H 13200—2400/4160Y
3— 333 KVA G-E 2400/4160Y—240/480
3— 333 KVA Wag. 2400—120/240
1—1500/1875 KVA Mol. 3-Ph. 40,500—4800 F/C equipped
1—1500/1875 KVA Mol. 3-Ph. 34,500—2400 F/C equipped

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TRANSFORMERS

Qu.	KVA	MFG.	VOLTAGE
1	12000	G. E.	115,000—46,000 L. T. C.
1	5000	West.	115,000—13,750, 3 Ph.
1	10000	West.	67,000—34,500, 3 Ph. Auto.
1	3750	G. E.	69,300—13,200, 3 Ph.
1	3000	G. E.	69,000—4340, 3 Ph.
4	2000	Amer.	67,650—22,000
6	1667	West.	66,000—2300/4000
3	1250	G. E.	69,300—2400/4160
6	750	Wagner	66,000Y—13,200
4	333	West.	67,000—7200/12470Y
2	2500	Wagner	45,000—4160Y, 3 Ph.
3	333	G. E.	44,000—480
1	5000	West.	34,500—13750/6875, 3 Ph. *
1	4500	West.	33,000—2500/4330, 3 Ph.
2	3000	Upgf.	34,750—4160, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1250	A. C.	33,000—480
4	750	Wagner	33,000Y—6900
3	500	Mol.	34,500—2300/4600
3	200	A. C.	34,500—2400/7200/12470Y
2	3000	G. E.	26,400—4160Y/2400, 3 Ph.
2	3000	G. E.	13,800—2640, 3 Ph.
1	2500	G. E.	13,800—2400, 3 Ph. Unit Sub.
3	667	G. E.	13,200—240/480
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
1	4500	West.	7,245—2300, 3 Ph.
1	1000	A. C.	2,400/4,160—240, 3 Ph.
3	400	G. E.	2,300/4,000—230/460

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1 4600 Kw, 60 cycle, 13800 volts, Generator
6500 Hp, 25 cycle, 11000 volts, Motor—300 Rpm
1 2500 Kw, 25 cycle, 2400 volts, Generator
3500 Hp, 60 cycle, 6600 volts, Motor—300 Rpm
1 2000 Kw, 62½ cycle, 2300/4000 volts, Generator
2800 Hp, 25 cycle, 2300/4000v, Motor—750 Rpm

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U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5564) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, May 4, 1961, for furnishing thirty-three (33), 230-, 161-, 69-, and 15-kv, 1,200- and 600- ampere, 3-pole, m-g-o- disconnecting and interrupter switches; and five (5) 15-kv, disconnecting fuses for Sioux City Substation (04), Missouri River Basin Project. Delivery is desired within 220 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. Floyd E. Dominy, Commissioner.

Need Engineers?

Contact them through this

EMPLOYMENT OPPORTUNITIES section

OFFICIAL PROPOSALS

Bids: April 28, 1961

Power Authority of the State of New York
St. Lawrence Power Project

ADVERTISEMENT FOR PROPOSALS
Sale of Insulated Wire and Cable

The Power Authority of the State of New York is offering for sale, to the highest bidder, approximately 83,000 pounds of insulated electrical conductor and direct burial cable.

This material is unused and is located at the St. Lawrence Power Project, near Massena, New York, where it may be inspected by prospective bidders until April 28, 1961.

Bidding documents, containing terms of sale and a description of the material offered, may be obtained upon application to Uhl, Hall & Rich, engineers for the Power Authority, P.O. Box 68, Massena, New York.

Bids will be received in writing only, and must be received prior to 3:00 P.M. EST, May 10, 1961, in order to be considered.

The Power Authority reserves the right to reject any or all bids.

W. S. Chapin
General Manager

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Electrical Engineer—Excellent opportunity for graduate engineer to enter consulting field and grow with progressive Midwest concern. Board layout work—power, lighting, and control systems; calculations; and occasional field contacts. 3-5 years experience. Moving expenses paid. Send resume, including education, experience, and personal qualifications to P-6246, Electrical World.

Electrical Distribution Engineer—The Department of Public Utilities of the City of Norwich, Connecticut has an opening for an Electrical Distribution Engineer. Permanent employment with an opportunity for advancement to the position of Electrical Distribution Superintendent. Minimum requirement B.S. Degree in Electrical Engineering supplemented by at least six (6) years' experience, four (4) of which must have been in the Electrical Distribution Field. Starting salary $7,103.00 a year, progressing to $8,223.00 a year. Write to Department of Personnel, City Hall, Norwich, Connecticut, for application blank.

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Meetings Calendar

APRIL

• **Agricultural & Mechanical College Texas**—Fourteenth Annual Conference for Protective Relay Engineers, College Station, Texas, April 17-19.

• **Edison Electric Institute**—AGA-EEI National Conference of Electric & Gas Utility Accountants, The Chase-Park Plaza Hotels, St. Louis, April 17-19; SEE-EEI Joint Industrial Relations Conference, Roosevelt Hotel, New Orleans, April 20-21; Accident Prevention Committee, Hagerstown, Maryland, April 27-28.

American Institute of Electrical Engineers—Electric Welding, Commodore Hotel, New York City, April 17-21; Great Lakes District Meeting, Hotel Pick-Nicollet, Minneapolis, April 19-21.

Pacific Coast Electrical Association—Business Development Conference, Sheraton-Palace Hotel, San Francisco, April 17-18; Administrative Services Conference, Villa Hotel, San Mateo, April 27-28.

• **Georgia Power Co**—Street Lighting Conference, Biltmore Hotel, Atlanta, Georgia, April 19.

• **Pennsylvania Electric Association**—Land and Land Rights Committee, Skytop, April 20-21; Transmission and Distribution Committee, Irem Temple Country Club, Dallas, Pennsylvania, April 26-27; Communications Committee, Hagerstown, Maryland, April 27-28.

• **American Public Power Association**—Annual Convention, Granada Hotel, San Antonio, April 25-27.

• **Indiana Electric Association**—Annual Young Men's Utility Conference, Severin Hotel, Indianapolis, April 26-27.

• **Northwest Electric Light & Power Association**—Engineering and Operating Section joint with Personnel and Safety Section and Purchasing Committee, Sheraton-Portland Hotel, Portland, April 26-28.

• **Institute of Radio Engineers**—Seventh Region Technical Conference, Westward Ho Hotel, Phoenix, Arizona, April 26-28.

• **National Association of Electrical Distributors**—53rd Annual Convention, Detroit, April 29-May 3.

• **Air Conditioning & Refrigeration Institute**—Annual Meeting, The Homestead, Hot Springs, Va., April 30-May 3.

MAY

• **Illuminating Engineering Society**—Intermountain Regional Conference, Hotel Utah, Salt Lake City, May 1-2.

• **Pennsylvania Electric Association**—Systems Planning Committee, Hotel Alexander, Hagerstown, Maryland, May 1-2; Electrical Equipment Committee, Hotel Hershey, Hershey, Penn., May 4-5; Structures and Hydraulics, Hotel Yorktown, York, Penn., May 4-5; Prime Movers Committee, Bellevue Stratford Hotel and Eddystone Station, Philadelphia, May 11-12; Accident Prevention Committee, Port Jervis, N. Y., May 11-12; Meter Committee, Split Rock Lodge, Penn., May 11-12; Industrial Sales Conference, Skytop, Penn., May 11-12; Systems Operation Committee, Skytop, Penn., May 18-19; Street and Highway Lighting Committee, Wellsboro, Penn., May 18-19; Accounting Conference, Penn Sheraton, Pittsburgh, May 22-23; Customer Relations Conference, Hotel Hershey, Hershey, Penn., May 23-24; Relay Committee, Skytop, Penn., May 25-26; Motor Transportation, Hershey, Penn., May 25-26.

• **American Institute of Electrical Engineers**—Rural Electrification Conference, Kentucky Hotel, Louisville, May 1-3; Packaging Industry Conference, New Ocean House, Swampscott, Mass., May 15-16; North Eastern District Meeting, Statler Hotel, Hartford, May 17-19; Fractional Horsepower Motors Conference, Biltmore Hotel, Dayton, May 23.

• **Alabama Electric Cooperative, Inc.**—Annual Rural Electric Generating Cooperative Conference, Battle House Hotel, Mobile, Alabama, May 1-4.

• **Electric Association of Chicago**—Sixth Biennial Midwest Electrical Industry and Lighting Exposition, McCormick Place, Chicago 2-4.

• **Electric Components Conference**—Sponsored by AIEE-IRE-EIA-WCEMA, Jack Tar Hotel, San Francisco, May 2-4.

• **ECAP**—Copy Group, Leland Hotel, Detroit, Mich, May 3.

• **Midwest Association of Railroad and Utilities Commissioners**—Hotel Lassen, Wichita, Kansas, May 3-5.

• **Southeastern Association of Railroad & Utilities Commissioners**—Lafayette Hotel, Lexington, Kentucky, May 3-5.

• **Electric Council of New England**—Meter and Service Meeting, Hotel Viking, Newport, R. I., May 4-5.

• Additions this week.

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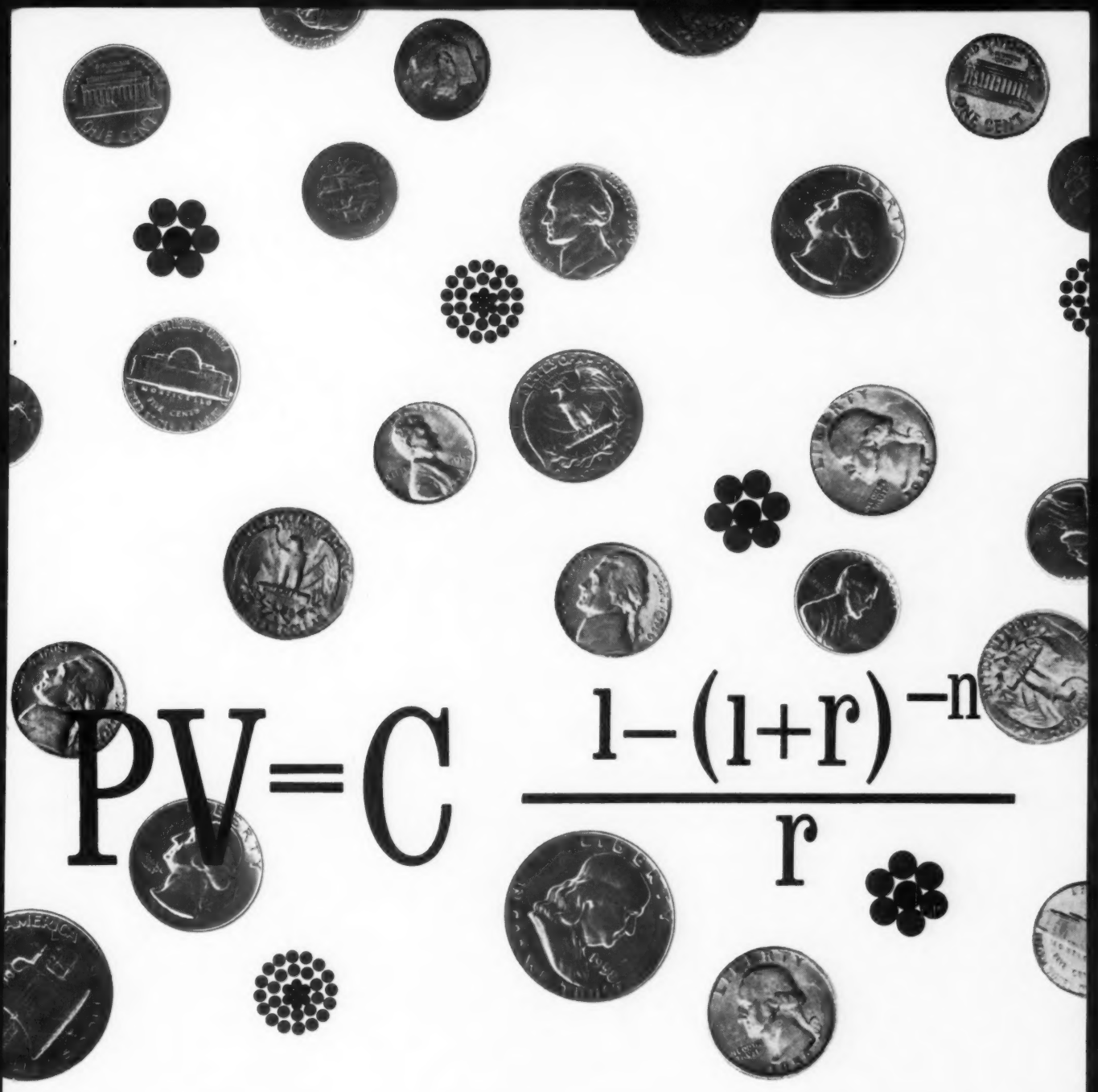

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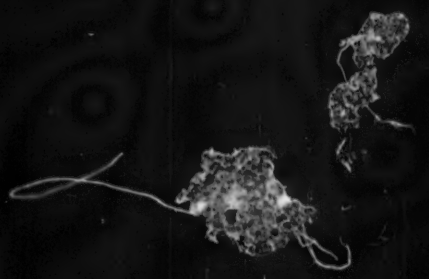
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